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NIROP FRIDLEY
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REMEDIAL INVESTIGATION OPERABLE UNIT 3 (OU3) VOLUME IV OF IV APPENDICES E
THROUGH J NIROP FRIDLEY MN
9/1/2001
TETRA TECH

Remedial Investigation for Operable Unit 3

Naval Industrial Reserve Ordnance Plant Fridley, Minnesota

VOLUME IV OF IV
APPENDICES E - J



**Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0003**

September 2001



TETRA TECH NUS, INC.

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PITT-09-1-046

September 24, 2001

Project Number 6966

Commander, Southern Division
Naval Facilities Engineering Command
Attn: Joel R. Sanders, Code ES327
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: CLEAN CONTRACT No. N62467-94-D-0888
Contract Task Order No. 0003

Subject: Remedial Investigation Report (OU3) – Volume 1
NIROP Fridley, Fridley Minnesota

Dear Joel:

As indicated in our recent September 19 letter provided with the distribution of the OU2 Risk Assessment (Supplemental Remedial Investigation Information Report), we would soon be following up with the enclosed Volume I for the OU3 Remedial Investigation Report (revised).

Revisions made to this document since the previous May, 2000 volume are relatively minor and do not impact the conclusions of the OU3 risk assessment. However, rather than provide change pages, we have provided an entire replacement volume for ease of use by those crafting the Environmental Restrictive Covenant. It is possible that further MPCA and EPA comments could necessitate further minor revision to be addressed by change pages to be inserted into this document.

Please note that at the rear of Volume I are replacement pages for Appendix F. Appendix F was originally provided in Volume III in August, 1999. Please remove the Appendix F material from Volume I and place it into previously-provided Volume III, removing the corresponding pages from August, 1999 Volume III. No other revisions or modification to Volumes II, III, or IV are required.

We have been notified that a minor error existed on Figure 2-1 distributed Friday in the OU-2 Risk Assessment Report. Please find a replacement Figure 2-1 for that report. Discard the Figure 2-1 originally received with the report and insert this replacement figure.

Sincerely,

Mark Sladic P.E.
Task Order Manager

MS/kf

Enclosure

cc: Dave Douglas, MPCA (2 copies)
John Aubert, NAVSEA (1 copy)

Mr. Joel Sanders
Naval Facilities Engineering Command
September 24, 2001 – Page 2

Tom Bloom, USEPA (1 copy)
Richard Harris, RAB Co-Chair (1 copy)
Doug Hildre UDLF (1 copy)
Bob Jupin, TtNUS (1 copy)
Mark Perry/File 6966 TtNUS (Unbound copy)
Debra Wroblewski TtNUS (Cover Letter Only)

APPENDIX E

ANALYTICAL DATABASE

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	10 U	11 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	10 U	10 U	11 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	10 U	11 U	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	10 U	11 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	10 U	11 U	10 U
1,2-DICHLOROETHANE	10 U	10 UJ	10 U	10 U	11 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	10 U	11 U	10 U
1,2-DICHLOROPROPANE	10 UJ	10 U	10 U	10 UJ	11 U	10 U
2-BUTANONE	2 J	5 J	3 J	10 UJ	11 U	3 J
2-HEXANONE	10 UJ	10 U	10 U	10 UJ	11 U	10 U
4-METHYL-2-PENTANONE	1 J	2 J	1 J	10 UJ	11 U	10 U
ACETONE	33 J	32 U	13 U	3 J	31 J	11 U
BENZENE	10 U	10 U	10 U	10 U	11 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	10 U	11 U	10 U
BROMOFORM	10 U	10 U	10 UJ	10 U	11 U	10 UJ
BROMOMETHANE	10 U	10 U	10 U	10 U	11 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	10 U	11 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	10 U	11 U	10 U
CHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
CHLOROETHANE	10 UJ	10 UJ	10 U	10 UJ	11 U	10 U
CHLOROFORM	10 U	10 U	10 U	10 U	11 U	10 U
CHLOROMETHANE	10 UJ	10 UJ	10 U	10 UJ	11 U	10 U
CIS-1,2-DICHLOROETHENE	10 U			10 U		
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	11 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	10 U	11 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

VOLATILES (µg/kg)

ETHYLBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
METHYLENE CHLORIDE	12 U	10 U	10 U	14 U	11 U	10 U
STYRENE	10 U	10 U	10 U	10 U	11 U	10 U
TETRACHLOROETHENE	10 U	10 U	10 UJ	10 U	11 U	10 UJ
TOLUENE	10 U	10 U	10 U	10 U	1 J	10 U
TRANS-1,2-DICHLOROETHENE	10 U			10 U		
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	11 U	10 U
TRICHLOROETHENE	10 U	10 U	10 U	10 U	11 U	1 J
VINYL CHLORIDE	10 UJ	10 U	10 U	10 UJ	11 U	10 U
XYLENES, TOTAL	1 J	1 J	10 U	10 U	11 U	10 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
2,4,5-TRICHLOROPHENOL	860 U	860 U	860 U	870 U	890 U	850 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
2,4-DINITROPHENOL	340 U	860 U	860 U	350 U	890 U	850 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	350 U	350 U	340 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	350 U	350 U	340 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	350 U	350 U	340 U
2-CHLOROPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
2-METHYLNAPHTHALENE	340 U	340 U	340 U	350 U	12 J	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
2-NITROANILINE	860 U	860 U	860 U	870 U	890 U	850 U
2-NITROPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	350 U	350 U	340 U
3-NITROANILINE	860 U	860 U	860 U	870 U	890 U	850 U
4,6-DINITRO-2-METHYLPHENOL	860 U	860 U	860 U	870 U	890 U	850 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	350 U	350 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
4-CHLOROANILINE	340 U	340 U	340 U	350 U	350 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	350 U	350 U	850 U
4-METHYLPHENOL	340 U	340 U	340 U	350 U	350 U	340 U
4-NITROANILINE	860 UJ	860 U	860 U	870 UJ	890 U	850 U
4-NITROPHENOL	860 UJ	860 U	860 U	870 U	890 U	850 U
ACENAPHTHENE	340 U	340 U	340 U	350 U	20 J	340 U
ACENAPHTHYLENE	340 U	340 U	340 U	350 U	350 U	340 U
ANTHRACENE	340 U	340 U	340 U	20 J	31 J	340 U
BENZO(A)ANTHRACENE	340 U	11 J	340 U	210 J	110 J	340 U
BENZO(A)PYRENE	340 U	340 U	340 U	120 J	84 J	340 U
BENZO(B)FLUORANTHENE	340 U	340 U	340 U	180 J	91 J	340 U
BENZO(G,H,I)PERYLENE	340 U	340 U	340 U	65 J	50 J	340 U
BENZO(K)FLUORANTHENE	340 U	340 U	340 U	120 J	65 J	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	350 U	350 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	350 U	350 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 U	350 UJ	350 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	340 U	340 U	350 U	350 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	340 U	340 U	340 U	350 U	350 U	340 U
CARBAZOLE	340 U	340 U	340 U	350 U	20 J	340 U
CHRYSENE	340 U	13 J	340 U	180 J	97 J	340 U
DI-N-BUTYL PHTHALATE	340 U	340 U	340 U	350 U	350 U	340 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	350 U	350 U	340 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	36 J	29 J	340 U
DIBENZOFURAN	340 U	340 U	340 U	350 U	350 U	340 U
DIETHYL PHTHALATE	340 U	340 U	340 U	350 U	350 U	850 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	350 U	350 U	340 U
FLUORANTHENE	340 U	19 J	340 U	320 J	240 J	340 U
FLUORENE	340 U	340 U	340 U	350 U	15 J	850 U
HEXACHLOROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	350 U	350 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	340 U	350 U	350 UJ	340 U
HEXACHLOROETHANE	340 U	340 U	340 U	350 U	350 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	340 U	73 J	54 J	340 U
ISOPHORONE	340 U	340 U	340 U	350 U	350 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	350 U	350 U	340 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	350 U	350 U	340 U
NAPHTHALENE	340 U	340 U	340 U	350 U	350 U	340 U
NITROBENZENE	340 U	340 U	340 U	350 U	350 U	340 U
PENTACHLOROPHENOL	340 U	860 U	860 U	350 U	890 U	850 U
PHENANTHRENE	340 U	340 U	340 U	76 J	180 J	340 U
PHENOL	340 U	340 U	340 U	350 U	350 U	340 U
PYRENE	340 U	21 J	340 U	290 J	190 J	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

SEMIVOLATILES (µg/kg)

PYRIDINE	340 UJ	340 UJ	340 UJ	350 UJ	350 U	340 UJ
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PCBs (µg/kg)

AROCLOR-1016	34 U	34 U	34 U	34 U	35 U	34 U
AROCLOR-1221	68 U	68 U	68 U	69 U	70 U	67 U
AROCLOR-1232	34 U	34 U	34 U	34 U	35 U	34 U
AROCLOR-1242	34 U	34 U	34 U	34 U	35 U	34 U
AROCLOR-1248	34 U	34 U	34 U	34 U	35 U	34 U
AROCLOR-1254	34 U	34 U	34 U	34 U	35 U	34 U
AROCLOR-1260	34 U	34 U	34 U	34 U	35 U	34 U

METALS (mg/kg)

ALUMINUM	3120 J	2880 J	2500 J	3770 J	4140 J	2270 J
ANTIMONY	3 UJ	3.3 UJ	3.3 UJ	3 UJ	3.6 UJ	3.4 UJ
ARSENIC	3.4 J	4.2	4.3	2.2 J	3.5	1.5
BARIUM	74.4 J	94.7 J	86.6 J	52.8 J	49.5 J	18.2 J
BERYLLIUM	0.16	0.19	0.19	0.16	0.24	0.2
CADMIUM	0.32 U	0.35 U	0.34 U	0.32 U	0.37 U	0.36 U
CALCIUM	6320 J	9350 J	10800 J	13300 J	9090 J	22400 J
CHROMIUM	7.8	6.6	5.8	9.1	7.5	7.1
COBALT	5.5 J	8.1 J	6.2 J	7 J	5.3 J	3.5 J
COPPER	6.3	6.8 J	5.4 J	8.8	8.8	3.6 U
CYANIDE	0.26 U	0.26 U	0.26 U	0.26 U	0.27 U	0.25 U
HEXAVALENT CHROMIUM		2 U	2 U		2 U	2 U
IRON	11800 J	12900 J	12500 J	10900 J	9680 J	4900 J
LEAD	3.8	11.4 J	5.4 J	3.6	40.3	1.8 J
MAGNESIUM	2970 J	3440 J	4420 J	4560 J	2310 J	4930 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-01	003-SB-004-01	003-SB-DP1-01	003-SB-006-01	003-SB-007-01	003-SB-008-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/13/97	07/22/97	07/22/97	07/08/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC04	AOC06	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:			003-SB-004-01			

METALS (mg/kg)

MANGANESE	676 J	1020 J	983 J	554 J	439 J	225 J
MERCURY	0.08 J	0.05 U	0.05 U	0.16 J	0.05 J	0.04 U
NICKEL	10.7	16.4	14.6	15.2	10.9	7.3
POTASSIUM	300 J	298 J	288 J	412 J	350 J	249 J
SELENIUM	0.15 U	0.16 UJ	0.17 UJ	0.14 U	0.18 UJ	0.19 UJ
SILVER	0.47 U	0.52 U	0.51 U	0.48 U	0.56 U	0.54 U
SODIUM	95.5	72 J	42.9 U	119	65.4 J	75 J
THALLIUM	0.15 U	0.16 U	0.19 U	0.14 UJ	0.18 U	0.24 U
VANADIUM	12.1	13.6 J	11.4 J	13.5	15.4 J	8.9 J
ZINC	16.6 J	18.1 J	16.3 J	19.5 J	28.8 J	11.1 U

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		1800 J	1500 J	1800 J		
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
1,1,2-TRICHLOROETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
1,1-DICHLOROETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
1,1-DICHLOROETHENE	10 U	100 U	100 UJ	11 U	11 U	10 U
1,2-DICHLOROETHANE	10 U	100 U	100 UJ	11 UJ	11 UJ	10 UJ
1,2-DICHLOROETHENE (TOTAL)	10 U	100 U	100 UJ	11 U	11 U	10 U
1,2-DICHLOROPROPANE	10 UJ	100 U	100 UJ	11 U	11 U	10 U
2-BUTANONE	5 J	100 U	100 UJ	2 J	5 J	1 J
2-HEXANONE	10 UJ	100 U	100 UJ	11 U	11 U	10 U
4-METHYL-2-PENTANONE	2 J	100 U	100 UJ	10 J	2 J	10 U
ACETONE	52 J	270	230 J	29 U	53 U	10 U
BENZENE	10 U	100 U	100 UJ	11 U	11 U	10 U
BROMODICHLOROMETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
BROMOFORM	10 U	100 U	100 UJ	11 U	11 U	10 U
BROMOMETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U
CARBON DISULFIDE	10 U	100 U	100 UJ	1 J	11 U	10 U
CARBON TETRACHLORIDE	10 U	100 U	100 UJ	11 U	11 U	10 U
CHLOROBENZENE	10 U	100 U	100 UJ	11 U	11 U	10 U
CHLOROETHANE	10 UJ	100 U	100 UJ	11 UJ	11 UJ	10 UJ
CHLOROFORM	10 U	100 U	100 UJ	11 U	11 U	10 U
CHLOROMETHANE	10 UJ	100 U	100 UJ	11 UJ	11 UJ	10 UJ
CIS-1,2-DICHLOROETHENE	10 U					
CIS-1,3-DICHLOROPROPENE	10 U	100 U	100 UJ	11 U	11 U	10 U
DIBROMOCHLOROMETHANE	10 U	100 U	100 UJ	11 U	11 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

VOLATILES (µg/kg)

ETHYLBENZENE	10 U	100 U	100 UJ	11 U	11 U	10 U
METHYLENE CHLORIDE	16 U	100 U	100 U	11 U	11 U	10 U
STYRENE	10 U	100 U	100 UJ	11 U	11 U	10 U
TETRACHLOROETHENE	10 U	100 U	100 UJ	11 U	11 U	1 J
TOLUENE	1 J	100 U	100 U	1 J	1 J	10 U
TRANS-1,2-DICHLOROETHENE	10 U					
TRANS-1,3-DICHLOROPROPENE	10 U	100 U	100 UJ	11 U	11 U	10 U
TRICHLOROETHENE	10 U	100 U	100 UJ	12	11 U	2 J
VINYL CHLORIDE	10 UJ	100 U	100 UJ	11 U	11 U	10 U
XYLENES, TOTAL	1 J	9 J	100 UJ	11 U	1 J	10 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
1,2-DICHLOROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
1,3-DICHLOROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
1,4-DICHLOROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
2,4,5-TRICHLOROPHENOL	850 U	830 U	830 U	920 U	890 U	860 U
2,4,6-TRICHLOROPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
2,4-DICHLOROPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
2,4-DIMETHYLPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
2,4-DINITROPHENOL	340 U	830 U	830 U	920 U	890 U	860 U
2,4-DINITROTOLUENE	340 U	330 U	330 U	370 U	350 U	340 U
2,6-DINITROTOLUENE	340 U	330 U	330 U	370 U	350 U	340 U
2-CHLORONAPHTHALENE	340 U	330 U	330 U	370 U	350 U	340 U
2-CHLOROPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
2-METHYLNAPHTHALENE	340 U	330 U	330 U	370 U	120 J	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
2-NITROANILINE	850 U	830 U	830 U	920 U	890 U	860 U
2-NITROPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
3,3'-DICHLOROBENZIDINE	340 U	330 U	330 U	370 U	350 U	340 U
3-NITROANILINE	850 U	830 U	830 U	920 U	890 U	860 U
4,6-DINITRO-2-METHYLPHENOL	850 U	830 U	830 U	920 U	890 U	860 U
4-BROMOPHENYL PHENYL ETHER	340 U	330 U	330 U	370 U	350 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
4-CHLOROANILINE	340 U	330 U	330 U	370 U	350 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	330 U	330 U	370 U	350 U	340 U
4-METHYLPHENOL	340 U	330 U	330 U	370 U	350 U	340 U
4-NITROANILINE	850 U	830 U	830 U	920 U	890 U	860 U
4-NITROPHENOL	850 U	830 U	830 U	920 U	350 U	860 U
ACENAPHTHENE	340 U	330 U	330 U	370 U	210 J	340 U
ACENAPHTHYLENE	340 U	330 U	330 U	370 U	760	340 U
ANTHRACENE	340 U	330 U	330 U	370 U	640	340 U
BENZO(A)ANTHRACENE	340 U	330 U	330 U	19 J	2700	340 U
BENZO(A)PYRENE	340 U	330 U	330 U	22 J	1700	340 U
BENZO(B)FLUORANTHENE	340 U	330 U	330 U	19 J	2100	340 U
BENZO(G,H,I)PERYLENE	340 U	330 U	330 U	15 J	640	340 U
BENZO(K)FLUORANTHENE	340 U	330 U	330 U	25 J	1300	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	330 U	330 U	370 U	350 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	330 U	330 U	370 U	350 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	330 U	330 U	370 U	350 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	330 U	330 U	370 U	350 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	340 U	330 U	330 U	370 U	350 U	340 U
CARBAZOLE	340 U	330 U	330 U	370 U	400	340 UJ
CHRYSENE	340 U	330 U	330 U	26 J	1700	340 U
DI-N-BUTYL PHTHALATE	340 U	330 U	330 U	370 U	28 J	340 U
DI-N-OCTYL PHTHALATE	340 U	330 U	330 U	370 U	350 U	340 U
DIBENZO(A,H)ANTHRACENE	340 U	330 U	330 U	11 J	400	340 U
DIBENZOFURAN	340 U	330 U	330 U	370 U	250 J	340 U
DIETHYL PHTHALATE	340 U	330 U	330 U	370 U	350 U	340 U
DIMETHYL PHTHALATE	340 U	330 U	330 U	370 U	350 U	340 U
FLUORANTHENE	13 J	330 U	330 U	29 J	5600	340 U
FLUORENE	340 U	330 U	330 U	370 U	400	340 U
HEXACHLOROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
HEXACHLOROBUTADIENE	340 U	330 U	330 U	370 U	350 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	330 U	330 U	370 U	350 U	340 U
HEXACHLOROETHANE	340 U	330 U	330 U	370 U	350 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	330 U	330 U	19 J	830	340 U
ISOPHORONE	340 U	330 U	330 U	370 U	350 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	330 U	330 U	370 U	350 U	340 U
N-NITROSODIPHENYLAMINE	340 U	330 U	330 U	370 U	350 U	340 U
NAPHTHALENE	340 U	330 U	330 U	370 U	55 J	340 U
NITROBENZENE	340 U	330 U	330 U	370 U	350 U	340 U
PENTACHLOROPHENOL	340 U	830 U	830 U	920 U	890 U	860 U
PHENANTHRENE	340 U	330 U	330 U	370 U	4500	340 U
PHENOL	340 U	330 U	330 U	370 U	350 U	340 U
PYRENE	13 J	330 U	330 U	26 J	4000	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

SEMIVOLATILES (µg/kg)

PYRIDINE	340 UJ	330 U	330 U	370 UJ	350 UJ	340 UJ
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PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	33 U	36 U	35 U	34 U
AROCLOR-1221	67 U	66 U	66 U	72 U	70 U	68 U
AROCLOR-1232	34 U	33 U	33 U	36 U	35 U	34 U
AROCLOR-1242	34 U	33 U	33 U	36 U	35 U	34 U
AROCLOR-1248	34 U	33 U	33 U	36 U	35 U	34 U
AROCLOR-1254	34 U	33 U	33 U	36 U	35 U	34 U
AROCLOR-1260	34 U	33 U	33 U	36 U	35 U	34 U

METALS (mg/kg)

ALUMINUM	2530 J	2390	1980	5260 J	3300 J	2860 J
ANTIMONY	2.8 UJ	2.9 UJ	2.2 UJ	4.1 UJ	3.4 J	3.4 UJ
ARSENIC	0.91 U	1.1 U	1.2 U	2.8 J	2.7 J	0.54 J
BARIUM	32.7 J	11.9	10.2	135 J	27.5 J	23 J
BERYLLIUM	0.07	0.18	0.15	0.26 U	0.15 U	0.18 U
CADMIUM	0.29 U	0.36 U	0.28 U	0.43 U	1.5 U	0.36 U
CALCIUM	4240 J	12600	13000	5920 J	5780 J	6020 J
CHROMIUM	6.3	8.1 J	6.2 J	7.4	12.6	7.5
COBALT	4.8 J	3.5	3.2	6.3	7.1 J	7.9
COPPER	3.8	2.1	1.7	5.2 J	60.7 J	10.2 J
CYANIDE	0.25 U	0.25 U	0.25 U	0.28 U	0.27 U	0.26 U
HEXAVALENT CHROMIUM	2 U	2 U	2 U		2 U	2 U
IRON	6440 J	5440 J	4810 J	14300 J	48400 J	5140 J
LEAD	2.8	2.8 J	2.7 J	3.5 J	733 J	6.4 J
MAGNESIUM	2130 J	3330 J	3560 J	1790 J	2630 J	2980 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-01	003-SB-015-01	003-SB-DP1-09	003-SB-016-01	003-SB-017-01	003-SB-018-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/14/97	09/22/97	09/22/97	07/26/97	07/25/97	07/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC15	AOC16	AOC17	AOC18
FIELD DUPLICATE OF:			003-SB-015-01			

METALS (mg/kg)

MANGANESE	285 J	107 J	95.9 J	1910 J	341 J	138 J
MERCURY	0.19 J	0.04 U	0.04 U	0.05 U	0.03 U	0.05 U
NICKEL	8.2	7.9	6.8	11.6 J	20.6 J	18 J
POTASSIUM	276 J	253	212	327 J	411 J	287 J
SELENIUM	0.15 U	0.16 UJ	0.17 UJ	0.2 UJ	0.14 UJ	0.18 UJ
SILVER	0.44 U	0.54 U	0.41 U	0.64 U	0.45 UJ	0.54 U
SODIUM	55.3	96.9 J	78.6 J	141 J	156 J	42.5 U
THALLIUM	0.15 U	0.16 UJ	0.17 U	0.2 U	0.15 U	0.2 U
VANADIUM	9.9	9.5	8.3	19.6 J	23 J	11.4 J
ZINC	13.4 J	12.4 J	11.1 J	19.1 J	21 J	18.8 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		970 J	740 J	19000 J		
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GENERAL CHEMISTRY

PH	7.9	11.3			8.4	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	100 U	100 U	100 U	100 U	51 U
1,1,2,2-TETRACHLOROETHANE	10 U	100 U	100 U	100 U	100 U	51 U
1,1,2-TRICHLOROETHANE	10 U	100 U	100 U	100 U	100 U	51 U
1,1-DICHLOROETHANE	10 U	100 U	100 U	100 U	100 U	51 U
1,1-DICHLOROETHENE	10 U	100 U	100 U	100 U	100 U	51 U
1,2-DICHLOROETHANE	10 U	100 U	100 U	100 U	100 U	51 U
1,2-DICHLOROETHENE (TOTAL)	10 U	100 U	100 U	100 U	100 U	51 U
1,2-DICHLOROPROPANE	10 U	100 U	100 U	100 U	100 U	51 U
2-BUTANONE	10 U	100 U	100 U	100 U	50 J	32 J
2-HEXANONE	10 U	100 U	100 U	100 U	100 U	51 U
4-METHYL-2-PENTANONE	10 U	100 U	100 U	34 J	51 J	34 J
ACETONE	8 J	200	100 U	100 U	160 U	200
BENZENE	10 U	100 U	100 U	100 U	100 U	51 U
BROMODICHLOROMETHANE	10 U	100 U	100 U	100 U	100 U	51 U
BROMOFORM	10 U	100 U	100 U	100 U	100 U	51 U
BROMOMETHANE	10 U	100 U	100 U	100 U	100 U	51 U
CARBON DISULFIDE	10 U	100 U	100 U	100 U	13 J	51 U
CARBON TETRACHLORIDE	10 U	100 U	100 U	100 U	100 U	51 U
CHLOROBENZENE	10 U	100 U	100 U	100 U	100 U	51 U
CHLOROETHANE	10 U	100 UJ	100 U	100 U	100 U	51 U
CHLOROFORM	10 U	100 U	100 U	100 U	100 U	51 U
CHLOROMETHANE	10 UJ	100 U	100 U	100 U	100 U	51 U
CIS-1,3-DICHLOROPROPENE	10 U	100 U	100 U	100 U	100 U	51 U
DIBROMOCHLOROMETHANE	10 U	100 U	100 U	100 U	100 U	51 U
ETHYLBENZENE	10 U	100 U	100 U	100 U	100 U	51 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	100 U	150 U	100 U	100 U	51 U
STYRENE	10 U	100 U	100 U	100 U	100 U	51 U
TETRACHLOROETHENE	10 U	100 U	100 U	100 U	100 U	51 U
TOLUENE	1 J	100 U	100 U	100 U	100 U	3 J
TRANS-1,3-DICHLOROPROPENE	10 U	100 U	100 U	100 U	100 U	51 U
TRICHLOROETHENE	4 J	6 J	100 U	100 U	100 U	51 U
VINYL CHLORIDE	10 U	100 U	100 U	100 U	100 U	51 U
XYLENES, TOTAL	10 U	100 U	100 U	100 U	100 U	6 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
1,2-DICHLOROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
1,3-DICHLOROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
1,4-DICHLOROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
2,4,5-TRICHLOROPHENOL	850 U	840 U	830 U	8700 U	870 U	850 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
2,4-DICHLOROPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
2,4-DIMETHYLPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
2,4-DINITROPHENOL	340 U	840 U	830 U	8700 U	870 U	850 U
2,4-DINITROTOLUENE	340 U	340 U	330 U	3500 U	350 U	340 U
2,6-DINITROTOLUENE	340 U	340 U	330 U	3500 U	350 U	340 U
2-CHLORONAPHTHALENE	340 U	340 U	330 U	3500 U	350 U	340 U
2-CHLOROPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
2-METHYLNAPHTHALENE	340 U	340 U	330 U	1000 J	350 U	340 U
2-METHYLPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
2-NITROANILINE	850 U	840 U	830 U	8700 U	870 U	850 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
3,3'-DICHLOROBENZIDINE	340 UJ	340 U	330 U	3500 U	350 U	340 U
3-NITROANILINE	850 U	840 U	830 U	8700 U	870 U	850 U
4,6-DINITRO-2-METHYLPHENOL	850 U	840 U	830 U	8700 U	870 U	850 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	330 U	3500 U	350 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
4-CHLOROANILINE	340 U	340 U	330 U	3500 U	350 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	330 U	3500 U	350 U	340 U
4-METHYLPHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
4-NITROANILINE	850 UJ	840 U	830 U	8700 U	870 U	850 UJ
4-NITROPHENOL	850 U	840 U	830 U	8700 U	870 U	850 U
ACENAPHTHENE	340 U	340 U	330 U	650 J	350 U	340 U
ACENAPHTHYLENE	340 U	340 U	330 U	3500 U	350 U	340 U
ANTHRACENE	340 U	340 U	330 U	110 J	350 U	340 U
BENZO(A)ANTHRACENE	340 U	340 U	330 U	3500 U	18 J	340 U
BENZO(A)PYRENE	340 U	340 U	330 U	3500 U	15 J	340 U
BENZO(B)FLUORANTHENE	340 U	340 U	330 U	3500 U	12 J	340 U
BENZO(G,H,I)PERYLENE	340 U	340 U	330 U	3500 U	350 U	340 U
BENZO(K)FLUORANTHENE	340 U	340 U	330 U	3500 U	14 J	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	330 U	3500 U	350 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	330 U	3500 U	350 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	330 U	3500 U	350 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	340 U	25 J	19000 U	350 U	60 J
BUTYLBENZYL PHTHALATE	340 U	340 U	330 U	3500 U	350 U	340 U
CARBAZOLE	340 U	340 U	330 U	3500 U	350 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	340 U	340 U	330 U	3500 U	21 J	340 U
DI-N-BUTYL PHTHALATE	340 U	340 U	330 U	3500 U	350 U	340 U
DI-N-OCTYL PHTHALATE	340 U	340 U	330 U	3500 U	350 U	340 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	330 U	3500 U	350 U	340 U
DIBENZOFURAN	340 U	340 U	330 U	3500 U	350 U	340 U
DIETHYL PHTHALATE	340 U	340 U	330 U	3500 U	350 U	340 U
DIMETHYL PHTHALATE	340 U	340 U	330 U	3500 U	350 U	340 U
FLUORANTHENE	340 U	340 U	330 U	100 J	39 J	340 U
FLUORENE	340 U	340 U	330 U	760 J	350 U	340 U
HEXACHLOROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
HEXACHLOROBUTADIENE	340 U	340 U	330 U	3500 U	350 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	330 UJ	3500 U	350 U	340 U
HEXACHLOROETHANE	340 U	340 U	330 U	3500 U	350 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	330 U	3500 U	350 U	340 U
ISOPHORONE	340 U	340 U	330 U	3500 U	350 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	330 U	3500 U	350 U	340 U
N-NITROSODIPHENYLAMINE	340 U	340 U	330 U	3500 U	350 U	340 U
NAPHTHALENE	340 U	340 U	330 U	3500 U	350 U	340 U
NITROBENZENE	340 U	340 U	330 U	3500 U	350 U	340 U
PENTACHLOROPHENOL	340 U	840 U	830 U	8700 U	870 U	850 U
PHENANTHRENE	340 U	340 U	330 U	1200 J	29 J	340 U
PHENOL	340 U	340 U	330 U	3500 U	350 U	340 U
PYRENE	340 U	340 U	330 U	340 J	35 J	340 U
PYRIDINE	340 UJ	340 U	330 U	3500 U	350 UJ	340 UJ

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	33 U	34 U	34 U	150
AROCLOR-1221	67 U	67 U	66 U	69 U	69 U	67 U
AROCLOR-1232	34 U	33 U	33 U	34 U	34 U	34 U
AROCLOR-1242	34 U	33 U	33 U	34 U	34 U	34 U
AROCLOR-1248	34 U	33 U	33 U	34 U	34 U	34 U
AROCLOR-1254	34 U	33 U	33 U	34 U	34 U	34 U
AROCLOR-1260	34 U	33 U	33 U	34 U	34 U	34 U

METALS (mg/kg)

ALUMINUM	2500 J	1660	2550 J	3150 J	2840 J	2700 J
ANTIMONY	3.3 UJ	2.8 UJ	3.5 UJ	2.4 UJ	2.6 UJ	3.5 UJ
ARSENIC	1.2 J	1.8 J	0.6	1.6	0.97	1
BARIUM	12.1 J	10.5	9.1 J	29.5 J	21.2 J	19.7 J
BERYLLIUM	0.18	0.11	0.15	0.2 U	0.21 U	0.16
CADMIUM	0.35 U	0.35 U	0.37 U	0.31 U	0.32 U	0.37 U
CALCIUM	4490 J	23500	1490 J	34100 J	5260 J	14500 J
CHROMIUM	6.7 J	6.5 J	8.2	9.7	8.8	6.5
COBALT	4.5	5	6.4 J	5	4.1	3.2 U
COPPER	7.6	0.93	1.3	26.2 J	23.1 J	7.3
CYANIDE	0.25 U	0.25 U	0.25 U	0.26 UJ	0.26 UJ	0.25 U
HEXAVALENT CHROMIUM					2 U	2 U
IRON	6480 J	4190 J	4300 J	7200 J	6470 J	6260 J
LEAD	2.9 J	1.6 J	2	4.3	10.3	2.1
MAGNESIUM	2220 J	6050 J	1390 J	7000 J	2040 J	4550 J
MANGANESE	117 J	276 J	43.8 J	210 J	163 J	164 J
MERCURY	0.04 U	0.04 U	0.06 J	0.04 U	0.04 U	0.05 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-023-01	003-SB-026-01	003-SB-027-01	003-SB-028-01	003-SB-029-01	003-SB-030-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/09/97	09/20/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC23	AOC26	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	8.5	7.1	9.5	8.4	8.8	7.6
POTASSIUM	282 J	159	230 J	497	306	374 J
SELENIUM	0.18 UJ	0.16 UJ	0.19 UJ	0.18 UJ	0.2 U	0.18 UJ
SILVER	0.53 U	0.53 U	0.55 U	0.46 U	0.48 U	0.55 U
SODIUM	94.7 J	58.2 J	77.9 J	364 J	93.5 J	188 J
THALLIUM	0.18 UR	0.16 UJ	0.19 U	0.19 U	0.2 U	0.18 U
VANADIUM	21.1	7.6	10.6 J	11 J	17.1 J	14 J
ZINC	13.4 J	9.6 J	15.4 J	20.6 J	52.7 J	14 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON			960 J	2000 J		780 J
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GENERAL CHEMISTRY

PH						10.8
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	100 U	10 U	11 U	10 U	29 U
1,1,2,2-TETRACHLOROETHANE	11 U	100 U	10 U	11 U	10 UJ	29 U
1,1,2-TRICHLOROETHANE	11 U	100 U	10 U	11 U	10 U	29 U
1,1-DICHLOROETHANE	11 U	100 U	10 U	11 U	10 U	29 U
1,1-DICHLOROETHENE	11 U	100 U	10 U	11 U	10 U	29 U
1,2-DICHLOROETHANE	11 U	100 U	10 U	11 U	10 U	29 U
1,2-DICHLOROETHENE (TOTAL)	11	100 U	10 U	11 U	10 U	29 U
1,2-DICHLOROPROPANE	11 U	100 U	10 U	11 U	10 U	29 U
2-BUTANONE	11 U	100 U	10 U	3 J	8 J	81
2-HEXANONE	11 U	100 U	10 U	11 U	1 J	29 U
4-METHYL-2-PENTANONE	5 J	100 U	10 U	11 U	7 J	21 J
ACETONE	20	100 U	10 U	24 U	9 J	340
BENZENE	11 U	100 U	10 U	11 U	10 U	29 U
BROMODICHLOROMETHANE	11 U	100 U	10 U	11 U	10 U	29 U
BROMOFORM	11 U	100 U	10 U	11 UJ	10 U	29 U
BROMOMETHANE	11 U	100 U	10 U	11 U	10 U	29 U
CARBON DISULFIDE	11 U	100 U	10 U	11 U	10 U	29 U
CARBON TETRACHLORIDE	11 U	100 U	10 U	11 U	10 U	29 U
CHLOROBENZENE	11 U	100 U	10 U	11 U	10 U	29 U
CHLOROETHANE	11 U	100 U	10 U	11 U	10 U	29 U
CHLOROFORM	11 U	100 U	10 U	11 U	10 U	29 U
CHLOROMETHANE	11 U	100 U	10 U	11 U	10 U	29 UJ
CIS-1,3-DICHLOROPROPENE	11 U	100 U	10 U	11 U	10 U	29 U
DIBROMOCHLOROMETHANE	11 U	100 U	10 U	11 U	10 U	29 U
ETHYLBENZENE	11 U	100 U	10 U	11 U	10 U	2 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	13 U	100 U	10 U	11 U	10 U	29 U
STYRENE	11 U	100 U	10 U	11 U	10 U	29 U
TETRACHLOROETHENE	1 J	100 U	10 U	11 UJ	10 U	16 J
TOLUENE	1 J	100 U	1 J	1 J	10 U	5 J
TRANS-1,3-DICHLOROPROPENE	11 U	100 U	10 U	11 U	10 U	29 U
TRICHLOROETHENE	1 J	100 U	10 U	3 J	10 UJ	22 J
VINYL CHLORIDE	11 U	100 U	10 U	11 U	10 U	29 U
XYLENES, TOTAL	11 U	100 U	10 U	11 U	1 J	6 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
1,2-DICHLOROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
1,3-DICHLOROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
1,4-DICHLOROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
2,4,5-TRICHLOROPHENOL	900 U	850 U	870 U	950 U	840 U	970 U
2,4,6-TRICHLOROPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
2,4-DICHLOROPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
2,4-DIMETHYLPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
2,4-DINITROPHENOL	900 U	850 U	870 U	950 U	840 U	970 U
2,4-DINITROTOLUENE	360 U	340 U	350 U	380 U	340 U	390 U
2,6-DINITROTOLUENE	360 U	340 U	350 U	380 U	340 U	390 U
2-CHLORONAPHTHALENE	360 U	340 U	350 U	380 U	340 U	390 U
2-CHLOROPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
2-METHYLNAPHTHALENE	360 U	340 U	350 U	380 U	340 U	390 U
2-METHYLPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
2-NITROANILINE	900 U	850 U	870 U	950 U	840 U	970 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
3,3'-DICHLOROBENZIDINE	360 U	340 U	350 UJ	380 UJ	340 UJ	390 U
3-NITROANILINE	900 U	850 U	870 UJ	950 UJ	840 U	970 U
4,6-DINITRO-2-METHYLPHENOL	900 U	850 U	870 U	950 U	840 U	970 U
4-BROMOPHENYL PHENYL ETHER	360 U	340 U	350 U	380 U	340 U	390 U
4-CHLORO-3-METHYLPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
4-CHLOROANILINE	360 U	340 U	350 U	380 U	340 U	390 U
4-CHLOROPHENYL PHENYL ETHER	360 U	340 U	350 U	380 U	340 U	390 U
4-METHYLPHENOL	360 U	340 U	350 U	380 U	340 U	390 U
4-NITROANILINE	900 U	850 U	870 UJ	950 UJ	840 UJ	970 U
4-NITROPHENOL	900 U	850 U	870 U	950 U	840 U	970 U
ACENAPHTHENE	360 U	340 U	350 U	380 U	340 U	390 U
ACENAPHTHYLENE	360 U	340 U	350 U	380 U	340 U	390 U
ANTHRACENE	360 U	340 U	350 U	380 U	340 U	390 U
BENZO(A)ANTHRACENE	36 J	92 J	350 U	39 J	340 U	390 U
BENZO(A)PYRENE	25 J	58 J	350 U	26 J	340 U	390 U
BENZO(B)FLUORANTHENE	33 J	73 J	350 U	47 J	340 U	390 U
BENZO(G,H,I)PERYLENE	21 J	34 J	350 U	17 J	340 U	390 U
BENZO(K)FLUORANTHENE	25 J	64 J	350 U	26 J	16 J	390 U
BIS(2-CHLOROETHOXY)METHANE	360 U	340 U	350 U	380 U	340 U	390 U
BIS(2-CHLOROETHYL)ETHER	360 U	340 U	350 U	380 U	340 U	390 U
BIS(2-CHLOROISOPROPYL) ETHER	360 U	340 UJ	350 U	380 U	340 U	390 U
BIS(2-ETHYLHEXYL)PHTHALATE	18 J	340 U	350 U	380 U	340 U	390 U
BUTYLBENZYL PHTHALATE	360 U	340 U	350 U	380 U	340 U	390 U
CARBAZOLE	360 U	340 U	350 U	380 U	340 U	390 UJ

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	21 J	70 J	350 U	39 J	11 J	390 U
DI-N-BUTYL PHTHALATE	360 U	340 U	350 U	380 U	340 U	390 U
DI-N-OCTYL PHTHALATE	360 U	340 U	350 U	380 U	340 U	390 U
DIBENZO(A,H)ANTHRACENE	360 U	33 J	350 U	380 U	340 U	390 U
DIBENZOFURAN	360 U	340 U	350 U	380 U	340 U	390 U
DIETHYL PHTHALATE	360 U	340 U	350 U	380 U	340 U	390 U
DIMETHYL PHTHALATE	360 UJ	340 U	350 U	380 U	340 U	390 U
FLUORANTHENE	49 J	88 J	350 U	92 J	10 J	390 U
FLUORENE	360 U	340 U	350 U	380 U	340 U	390 U
HEXACHLOROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
HEXACHLOROBUTADIENE	360 U	340 U	350 U	380 U	340 U	390 U
HEXACHLOROCYCLOPENTADIENE	360 U	340 U	350 U	380 U	340 U	390 U
HEXACHLOROETHANE	360 U	340 U	350 U	380 U	340 U	390 U
INDENO(1,2,3-CD)PYRENE	15 J	46 J	350 U	21 J	340 U	390 U
ISOPHORONE	360 U	340 U	350 U	380 U	340 U	390 U
N-NITROSO-DI-N-PROPYLAMINE	360 U	340 U	350 U	380 U	340 U	390 U
N-NITROSODIPHENYLAMINE	360 U	340 U	350 U	380 U	340 U	390 U
NAPHTHALENE	360 U	340 U	350 U	380 U	340 U	390 U
NITROBENZENE	360 U	340 U	350 U	380 U	340 U	390 U
PENTACHLOROPHENOL	900 U	850 U	870 U	950 U	840 U	970 U
PHENANTHRENE	32 J	340 U	350 U	49 J	340 U	390 U
PHENOL	360 U	340 U	350 U	380 U	340 U	390 U
PYRENE	43 J	78 J	350 U	65 J	12 J	390 U
PYRIDINE	360 UJ	340 UJ	350 U	380 U	340 UJ	390 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	35 U	34 U	34 U	38 U	33 U	38 U
AROCLOR-1221	71 U	67 U	69 U	75 U	67 U	77 U
AROCLOR-1232	35 U	34 U	34 U	38 U	33 U	38 U
AROCLOR-1242	35 U	34 U	34 U	38 U	33 U	38 U
AROCLOR-1248	35 U	34 U	34 U	38 U	33 U	38 U
AROCLOR-1254	35 U	34 U	34 U	38 U	33 U	38 U
AROCLOR-1260	35 U	34 U	34 U	38 U	33 U	38 U

METALS (mg/kg)

ALUMINUM	3910 J	1510 J	4870	5890	3460	6880
ANTIMONY	3.3 UJ	3 UJ	3.5 UR	3.6 UR	3.6 U	3.8 UJ
ARSENIC	2	0.74	1.4 J	2.5 J	0.93 J	4.7
BARIUM	40.2 J	7.5 J	19.6 J	108 J	29.2	67.4 J
BERYLLIUM	0.22	0.17 U	0.2 U	0.41 U	0.15	0.42 U
CADMIUM	0.34 U	0.38 U	0.37 U	0.75	0.38 U	0.4 U
CALCIUM	4350 J	1460 J	2960 J	31600 J	9720 J	26200 J
CHROMIUM	6.1	3.6	14.3	84	91 J	15 J
COBALT	6 J	2.4	6 J	5.4 J	5.5	6.8 J
COPPER	6.5	2.3 U	49.4	1360	6.8	9.8
CYANIDE	0.27 U	0.25 U	0.26 U	0.28 U	0.25 U	0.29 U
HEXAVALENT CHROMIUM				6	5	
IRON	8310 J	3750 J	9880 J	10600 J	5380 J	13300 J
LEAD	14.5	1.7 J	5.7	150	31.6 J	5.8 J
MAGNESIUM	2260 J	857 J	2710 J	14100 J	3690 J	11200 J
MANGANESE	295 J	33.6 J	105 J	323 J	104 J	500 J
MERCURY	0.05 U	0.04 U	0.04 U	0.1	0.04 U	0.05 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-032-01	003-SB-033-01	003-SB-034-01	003-SB-035-01	003-SB-036-01	003-SB-037-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC32	AOC33	AOC34	AOC35	AOC36	AOC37
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	11.9	4.9	12.6 J	33.5 J	9.9	16.3 J
POTASSIUM	381 J	166	505 J	906 J	515 J	1130 J
SELENIUM	0.88 UJ	0.19 UJ	0.93 UR	0.21 UR	0.19 UJ	0.88 UR
SILVER	0.51 U	0.57 U	0.55 U	0.56 U	0.57 U	0.6 U
SODIUM	94.9 J	74.6	147 J	176 J	184 J	256 J
THALLIUM	0.18 U	0.19 U	0.19 UJ	0.21 UJ	0.19 U	0.18 U
VANADIUM	12.3 J	11.5	18.1	23.4	11.3	28.7
ZINC	49.7 J	7.9 J	29.2 J	479 J	102 J	35.7 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON				1200 J		
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GENERAL CHEMISTRY

PH				8.6	9.1	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	29 U	11 U	110 U	100 U	100 U	110 U
1,1,2,2-TETRACHLOROETHANE	29 U	11 U	110 U	100 U	100 U	110 U
1,1,2-TRICHLOROETHANE	29 U	11 U	110 U	100 U	100 U	110 U
1,1-DICHLOROETHANE	29 U	11 U	110 U	100 U	100 U	110 U
1,1-DICHLOROETHENE	29 U	11 U	110 U	100 U	100 U	110 U
1,2-DICHLOROETHANE	29 U	11 UJ	110 U	100 U	100 U	110 U
1,2-DICHLOROETHENE (TOTAL)	29 U	11 U	110 U	100 U	100 U	110 U
1,2-DICHLOROPROPANE	29 U	11 U	110 U	100 U	100 U	110 U
2-BUTANONE	29 U	2 J	51 J	100 U	100 U	65 J
2-HEXANONE	29 U	1 J	110 U	100 U	100 U	110 U
4-METHYL-2-PENTANONE	29 U	2 J	30 J	100 U	100 U	47 J
ACETONE	42	18 U	400	59 J	280	500
BENZENE	29 U	11 U	110 U	100 U	100 U	110 U
BROMODICHLOROMETHANE	29 U	11 U	110 U	100 U	100 U	110 U
BROMOFORM	29 U	11 U	110 U	100 U	100 U	110 U
BROMOMETHANE	29 U	11 U	110 U	100 U	100 U	110 U
CARBON DISULFIDE	29 U	1 J	110 U	100 U	100 U	110 U
CARBON TETRACHLORIDE	29 U	11 U	110 U	100 U	100 U	110 U
CHLOROBENZENE	29 U	11 U	110 U	100 U	100 U	110 U
CHLOROETHANE	29 U	11 UJ	110 U	100 UJ	100 UJ	110 U
CHLOROFORM	29 U	11 U	110 U	100 U	100 U	110 U
CHLOROMETHANE	29 UJ	11 UJ	110 U	100 U	100 U	110 U
CIS-1,3-DICHLOROPROPENE	29 U	11 U	110 U	100 U	100 U	110 U
DIBROMOCHLOROMETHANE	29 U	11 U	110 U	100 U	100 U	110 U
ETHYLBENZENE	29 U	11 U	110 U	100 U	100 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

VOLATILES (µg/kg)

METHYLENE CHLORIDE	29 U	11 U	110 U	100 U	100 U	110 U
STYRENE	29 U	11 U	110 U	100 U	100 U	110 U
TETRACHLOROETHENE	7 J	1 J	110 U	100 U	100 U	110 U
TOLUENE	3 J	11 U	14 J	100 U	100 U	110 U
TRANS-1,3-DICHLOROPROPENE	29 U	11 U	110 U	100 U	100 U	110 U
TRICHLOROETHENE	10 J	22	110 U	100 U	100 U	110 U
VINYL CHLORIDE	29 U	11 U	110 U	100 U	100 U	110 U
XYLENES, TOTAL	29 U	11 U	7 J	100 U	13 J	110 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
1,2-DICHLOROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
1,3-DICHLOROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
1,4-DICHLOROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
2,4,5-TRICHLOROPHENOL	980 U	930 U	890 U	850 U	860 U	920 U
2,4,6-TRICHLOROPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
2,4-DICHLOROPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
2,4-DIMETHYLPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
2,4-DINITROPHENOL	980 U	930 U	890 U	850 U	860 U	920 U
2,4-DINITROTOLUENE	390 U	370 U	350 U	340 U	340 U	370 U
2,6-DINITROTOLUENE	390 U	370 U	350 U	340 U	340 U	370 U
2-CHLORONAPHTHALENE	390 U	370 U	350 U	340 U	340 U	370 U
2-CHLOROPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
2-METHYLNAPHTHALENE	390 U	370 U	350 U	340 U	340 U	370 U
2-METHYLPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
2-NITROANILINE	980 U	930 U	890 U	850 U	860 U	920 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
3,3'-DICHLOROBENZIDINE	390 U	370 U	350 U	340 U	340 U	370 U
3-NITROANILINE	980 U	930 U	890 U	850 U	860 U	920 U
4,6-DINITRO-2-METHYLPHENOL	980 U	930 U	890 U	850 U	860 U	920 U
4-BROMOPHENYL PHENYL ETHER	390 U	370 U	350 U	340 U	340 U	370 U
4-CHLORO-3-METHYLPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
4-CHLOROANILINE	390 U	370 U	350 U	340 U	340 U	370 U
4-CHLOROPHENYL PHENYL ETHER	390 U	370 U	350 U	340 U	340 U	370 U
4-METHYLPHENOL	390 U	370 U	350 U	340 U	340 U	370 U
4-NITROANILINE	980 U	930 U	890 U	850 U	860 U	920 U
4-NITROPHENOL	980 U	930 U	890 U	850 U	860 U	920 U
ACENAPHTHENE	390 U	11 J	29 J	340 U	340 U	370 U
ACENAPHTHYLENE	390 U	370 U	350 U	340 U	340 U	370 U
ANTHRACENE	390 U	24 J	50 J	340 U	340 U	370 U
BENZO(A)ANTHRACENE	390 U	140 J	330 J	340 U	340 U	370 U
BENZO(A)PYRENE	390 U	110 J	170 J	340 U	340 U	370 U
BENZO(B)FLUORANTHENE	390 U	120 J	300 J	340 U	340 U	370 U
BENZO(G,H,I)PERYLENE	390 U	100 J	140 J	340 U	340 U	370 U
BENZO(K)FLUORANTHENE	390 U	90 J	140 J	340 U	340 U	370 U
BIS(2-CHLOROETHOXY)METHANE	390 U	370 U	350 U	340 U	340 U	370 U
BIS(2-CHLOROETHYL)ETHER	390 U	370 U	350 U	340 U	340 U	370 U
BIS(2-CHLOROISOPROPYL) ETHER	390 U	370 U	350 U	340 U	340 U	370 U
BIS(2-ETHYLHEXYL)PHTHALATE	390 U	370 U	350 U	340 U	770 U	370 U
BUTYLBENZYL PHTHALATE	390 U	370 U	350 U	340 U	340 U	370 U
CARBAZOLE	390 UJ	16 J	31 J	340 U	340 U	370 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

SEMIVOLATILES (µg/kg)

CHRYSENE	390 U	140 J	190 J	340 U	340 U	370 U
DI-N-BUTYL PHTHALATE	390 U	370 U	350 U	340 U	340 U	370 U
DI-N-OCTYL PHTHALATE	390 U	370 U	350 U	340 U	340 U	370 U
DIBENZO(A,H)ANTHRACENE	390 U	49 J	96 J	340 U	340 U	370 U
DIBENZOFURAN	390 U	370 U	11 J	340 U	340 U	370 U
DIETHYL PHTHALATE	390 U	370 U	350 U	340 U	340 U	370 U
DIMETHYL PHTHALATE	390 U	370 U	350 U	340 U	340 U	370 U
FLUORANTHENE	390 U	320 J	570	340 U	340 U	370 U
FLUORENE	390 U	17 J	25 J	340 U	340 U	370 U
HEXACHLOROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
HEXACHLOROBUTADIENE	390 U	370 U	350 U	340 U	340 U	370 U
HEXACHLOROCYCLOPENTADIENE	390 U	370 U	350 U	340 U	340 U	370 U
HEXACHLOROETHANE	390 U	370 U	350 U	340 U	340 U	370 U
INDENO(1,2,3-CD)PYRENE	390 U	100 J	170 J	340 U	340 U	370 U
ISOPHORONE	390 U	370 U	350 U	340 U	340 U	370 U
N-NITROSO-DI-N-PROPYLAMINE	390 U	370 U	350 U	340 U	340 U	370 U
N-NITROSODIPHENYLAMINE	390 U	370 U	350 U	340 U	340 U	370 U
NAPHTHALENE	390 U	370 U	350 U	340 U	340 U	370 U
NITROBENZENE	390 U	370 U	350 U	340 U	340 U	370 U
PENTACHLOROPHENOL	980 U	930 U	890 U	850 U	860 U	920 U
PHENANTHRENE	390 U	270 J	340 J	340 U	340 U	370 U
PHENOL	390 U	370 U	350 U	340 U	54 J	370 U
PYRENE	390 U	300 J	440	340 U	340 U	370 U
PYRIDINE	390 U	370 UJ	350 U	340 U	340 U	370 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

PCBs (µg/kg)

AROCLOR-1016	39 U	37 U	35 U	34 U	34 U	36 U
AROCLOR-1221	78 U	73 U	70 U	67 U	68 U	72 U
AROCLOR-1232	39 U	37 U	35 U	34 U	34 U	36 U
AROCLOR-1242	39 U	37 U	35 U	34 U	34 U	36 U
AROCLOR-1248	39 U	37 U	35 U	34 U	34 U	36 U
AROCLOR-1254	39 U	37 U	35 U	34 U	34 U	230 J
AROCLOR-1260	39 U	37 U	35 U	34 U	34 U	36 U

METALS (mg/kg)

ALUMINUM	7830	5780 J	3240 J	4170	3590	4040
ANTIMONY	3.2 UJ	3.6 UJ	3.2 UJ	2.5 UJ	3.2 J	3 UJ
ARSENIC	5.9	3	2.9	2.4 J	2.4 J	2.5 J
BARIUM	63.2 J	72.9 J	33.9 J	37.8	37.2	81.1
BERYLLIUM	0.27 U	0.38	0.16	0.25	0.21	0.23
CADMIUM	0.34 U	0.38 U	0.4 U	0.31 U	0.37 U	0.38 U
CALCIUM	20900 J	6930 J	16400 J	29100	23500	26800
CHROMIUM	20.3 J	12.4	45.1 J	16.9 J	9 J	10.8 J
COBALT	7.1 J	5.2 J	5	4.6	4	5.6
COPPER	11.7	16.6 J	9.1	5.3	5.1	13.2
CYANIDE	0.29 U	0.28 U	0.27 U	0.26 U	0.26 U	0.27 U
HEXAVALENT CHROMIUM			2	2 U	2 U	
IRON	14300 J	11500 J	7970 J	11200 J	10100 J	9070 J
LEAD	5.2 J	9.6 J	5 J	4.4 J	2.8 J	10.3 J
MAGNESIUM	10600 J	2840 J	6380 J	11000 J	8550 J	2830 J
MANGANESE	348 J	511 J	388 J	387 J	363 J	669 J
MERCURY	0.05	0.05 U	0.04 U	0.04 U	0.04 U	0.05 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-03	003-SB-038-01	003-SB-039-01	003-SB-046-01	003-SB-DP1-08	003-SB-047-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/06/97	07/23/97	09/25/97	09/19/97	09/19/97	09/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC37	AOC38	AOC39	AOC46	AOC46	AOC47
FIELD DUPLICATE OF:	003-SB-037-01				003-SB-046-01	

METALS (mg/kg)

NICKEL	24.7 J	11.7	13.2	12.3	9.4	16.7
POTASSIUM	832 J	293 J	223	437	421	388
SELENIUM	0.8 UR	0.19 UJ	0.21 UJ	0.19 UJ	0.78 UJ	0.2 UJ
SILVER	0.51 U	0.57 U	0.6 U	0.46 U	0.56 U	0.57 U
SODIUM	339 J	101 J	90.9 J	235 J	193 J	116 J
THALLIUM	0.16 U	0.27 U	0.21 U	0.22 J	0.16 UJ	0.24 J
VANADIUM	23.8	19.2 J	14.2 J	16	13.3	14.3
ZINC	30.6 J	25.3 J	19.6 J	18.8 J	18.6 J	36.4 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON				850 J	1300 J	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	1 J	11 U	56	21
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	11 U	11 U	12 U	12 U
1,1,2-TRICHLOROETHANE	110 U	110 U	11 U	11 U	12 U	12 U
1,1-DICHLOROETHANE	110 U	110 U	11 U	11 U	9 J	2 J
1,1-DICHLOROETHENE	110 U	110 U	11 U	11 U	12 U	12 U
1,2-DICHLOROETHANE	110 U	110 U	11 U	11 U	12 U	12 U
1,2-DICHLOROETHENE (TOTAL)	110 U	110 U	11 U	11 U	4 J	3 J
1,2-DICHLOROPROPANE	110 U	110 U	11 U	11 U	12 U	12 U
2-BUTANONE	52 J	110 U	4 J	7 J	12 U	12 U
2-HEXANONE	110 U	110 U	11 U	11 U	12 U	12 U
4-METHYL-2-PENTANONE	44 J	39 J	3 J	8 J	10 J	12 U
ACETONE	350	440	25 U	14	12 U	12 U
BENZENE	110 U	110 U	11 U	11 U	12 U	12 U
BROMODICHLOROMETHANE	110 U	110 U	11 U	11 U	12 U	12 U
BROMOFORM	110 U	110 U	11 U	11 U	12 U	12 U
BROMOMETHANE	110 U	110 U	2 J	11 U	12 U	12 U
CARBON DISULFIDE	110 U	110 U	1 J	11 U	1 J	12 U
CARBON TETRACHLORIDE	110 U	110 U	11 U	11 U	12 U	12 U
CHLOROENZENE	110 U	110 U	11 U	11 U	12 U	12 U
CHLOROETHANE	110 U	110 U	11 U	11 U	12 U	12 U
CHLOROFORM	110 U	110 U	11 U	11 U	12 U	12 U
CHLOROMETHANE	110 U	110 U	11 U	11 U	12 U	12 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	11 U	11 U	12 U	12 U
DIBROMOCHLOROMETHANE	110 U	110 U	11 U	11 U	12 U	12 U
ETHYLBENZENE	110 U	110 U	1 J	11 U	12 U	12 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	11 U	11 U	12 U	12 U
STYRENE	110 U	110 U	11 U	11 U	12 U	12 U
TETRACHLOROETHENE	110 U	110 U	11 U	11 U	4 J	1 J
TOLUENE	12 J	12 J	1 J	11 U	12 U	12 U
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	11 U	11 U	12 U	12 U
TRICHLOROETHENE	110 U	110 U	11 U	11 U	490	120
VINYL CHLORIDE	110 U	110 U	11 U	11 U	12 U	12 U
XYLENES, TOTAL	110 U	110 U	2 J	11 U	12 U	12 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	360 U	360 U	350 U	350 U	400 U	400 U
1,2-DICHLOROBENZENE	360 U	360 U	350 U	350 U	400 U	400 U
1,3-DICHLOROBENZENE	360 U	360 U	350 U	350 U	400 U	400 U
1,4-DICHLOROBENZENE	360 U	360 U	350 U	350 U	400 U	400 U
2,4,5-TRICHLOROPHENOL	900 U	900 U	890 U	880 U	990 U	990 U
2,4,6-TRICHLOROPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
2,4-DICHLOROPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
2,4-DIMETHYLPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
2,4-DINITROPHENOL	900 U	900 U	890 U	880 U	990 U	990 U
2,4-DINITROTOLUENE	360 U	360 U	350 U	350 U	400 U	400 U
2,6-DINITROTOLUENE	360 U	360 U	350 U	350 U	400 U	400 U
2-CHLORONAPHTHALENE	360 U	360 U	350 U	350 U	400 U	400 U
2-CHLOROPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
2-METHYLNAPHTHALENE	360 U	360 U	350 U	350 U	400 U	400 U
2-METHYLPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
2-NITROANILINE	900 U	900 U	890 U	880 U	990 U	990 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
3,3'-DICHLOROBENZIDINE	360 U	360 U	350 UJ	350 U	400 U	400 U
3-NITROANILINE	900 U	900 U	890 UJ	880 U	990 U	990 U
4,6-DINITRO-2-METHYLPHENOL	900 U	900 U	890 U	880 U	990 U	990 U
4-BROMOPHENYL PHENYL ETHER	360 U	360 U	350 U	350 U	400 U	400 U
4-CHLORO-3-METHYLPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
4-CHLOROANILINE	360 U	360 U	350 U	350 U	400 U	400 U
4-CHLOROPHENYL PHENYL ETHER	360 U	360 U	350 U	350 U	400 U	400 U
4-METHYLPHENOL	360 U	360 U	350 U	350 U	400 U	400 U
4-NITROANILINE	900 U	900 U	890 UJ	880 UJ	990 U	990 U
4-NITROPHENOL	900 U	900 U	890 U	880 U	990 U	990 U
ACENAPHTHENE	360 U	360 U	24 J	350 U	400 U	400 U
ACENAPHTHYLENE	360 U	360 U	350 U	350 U	400 U	400 U
ANTHRACENE	360 U	360 U	40 J	350 U	400 U	400 U
BENZO(A)ANTHRACENE	360 U	360 U	120 J	350 U	400 U	400 U
BENZO(A)PYRENE	360 U	360 U	85 J	350 U	400 U	400 U
BENZO(B)FLUORANTHENE	360 U	360 U	110 J	350 U	400 U	400 U
BENZO(G,H,I)PERYLENE	360 U	360 U	40 J	350 U	400 U	400 U
BENZO(K)FLUORANTHENE	360 U	360 U	59 J	350 U	400 U	400 U
BIS(2-CHLOROETHOXY)METHANE	360 U	360 U	350 U	350 U	400 U	400 U
BIS(2-CHLOROETHYL)ETHER	360 U	360 U	350 U	350 U	400 U	400 U
BIS(2-CHLOROISOPROPYL) ETHER	360 U	360 U	350 U	350 U	400 U	400 U
BIS(2-ETHYLHEXYL)PHTHALATE	360 U	340 U	350 U	20 J	17 J	71 J
BUTYLBENZYL PHTHALATE	360 U	360 U	350 U	350 U	400 U	400 U
CARBAZOLE	360 U	360 U	28 J	350 U	400 U	400 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

SEMIVOLATILES (µg/kg)

CHRYSENE	360 U	360 U	110 J	350 U	400 U	400 U
DI-N-BUTYL PHTHALATE	360 U	360 U	350 U	350 U	400 U	400 U
DI-N-OCTYL PHTHALATE	360 U	360 U	350 U	350 U	400 U	400 U
DIBENZO(A,H)ANTHRACENE	360 U	360 U	38 J	350 U	400 U	400 U
DIBENZOFURAN	360 U	360 U	350 U	350 U	400 U	400 U
DIETHYL PHTHALATE	360 U	360 U	350 U	350 U	400 U	400 U
DIMETHYL PHTHALATE	360 U	360 U	350 U	350 U	400 UJ	400 UJ
FLUORANTHENE	360 U	360 U	320 J	350 U	400 U	400 U
FLUORENE	360 U	360 U	19 J	350 U	400 U	400 U
HEXACHLORO BENZENE	360 U	360 U	350 U	350 U	400 U	400 U
HEXACHLOROBUTADIENE	360 U	360 U	350 U	350 U	400 U	400 U
HEXACHLOROCYCLOPENTADIENE	360 U	360 U	350 U	350 U	400 U	400 U
HEXACHLOROETHANE	360 U	360 U	350 U	350 U	400 U	400 U
INDENO(1,2,3-CD)PYRENE	360 U	360 U	60 J	350 U	400 U	400 U
ISOPHORONE	360 U	360 U	350 U	350 U	400 U	400 U
N-NITROSO-DI-N-PROPYLAMINE	360 U	360 U	350 U	350 U	400 U	400 U
N-NITROSODIPHENYLAMINE	360 U	360 U	350 U	350 U	400 U	400 U
NAPHTHALENE	360 U	360 U	350 U	350 U	400 U	400 U
NITROBENZENE	360 U	360 U	350 U	350 U	400 U	400 U
PENTACHLOROPHENOL	900 U	900 U	890 U	880 U	990 U	990 U
PHENANTHRENE	360 U	360 U	230 J	350 U	400 U	400 U
PHENOL	360 U	360 U	350 U	350 U	400 U	400 U
PYRENE	360 U	360 U	230 J	350 U	400 U	400 U
PYRIDINE	360 U	360 U	350 U	350 UJ	400 U	400 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

PCBs (µg/kg)

AROCLOR-1016	35 U	35 U	35 U	35 U	39 U	39 U
AROCLOR-1221	71 U	71 U	70 U	69 U	78 U	78 U
AROCLOR-1232	35 U	35 U	35 U	35 U	39 U	39 U
AROCLOR-1242	35 U	35 U	35 U	35 U	39 U	39 U
AROCLOR-1248	35 U	35 U	35 U	35 U	39 U	39 U
AROCLOR-1254	230	290	35 U	35 U	39 U	39 U
AROCLOR-1260	35 U	35 U	35 U	35 U	39 U	39 U

METALS (mg/kg)

ALUMINUM	3490 J	3610 J	3050	2590 J	6670 J	6350 J
ANTIMONY	3.3 UJ	3.3 UJ	3.8 UR	4 UJ	4 UR	4.2 UR
ARSENIC	2.5	2.8	2.9 J	0.89	5.1	4.1
BARIUM	38.6 J	123 J	18.1 J	18.5 J	72.4 J	85.5 J
BERYLLIUM	0.17	0.21	0.2 U	0.15	0.7 J	0.67 J
CADMIUM	0.46	0.58	0.4 U	0.42 U	0.59	0.45 U
CALCIUM	11700 J	11900 J	11000 J	19000 J	6940 J	6780 J
CHROMIUM	19.5 J	13.1 J	7.6	8.1	11.1 J	10.3 J
COBALT	6.5	5.5	5.7 J	3.9 U	9.1 J	10.4 J
COPPER	9.6	9	5.8	8.2	13.3	11.3
CYANIDE	0.27 U	0.27 U	0.27 U	0.26 U	0.3 U	0.3 U
HEXAVALENT CHROMIUM	2 U	2 U				
IRON	10500 J	10200 J	6980 J	6740 J	9810 J	10200 J
LEAD	8.7 J	7.1 J	3.9	1.9	7.7 J	9.4 J
MAGNESIUM	4050 J	4170 J	5450 J	5960 J	1670 J	1640 J
MANGANESE	473 J	1060 J	168 J	199 J	185 J	199 J
MERCURY	0.04 U	0.04 U	0.04 U	0.12	0.04 U	0.05 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-050-01	003-SB-DP1-10	003-SB-054-01	003-SB-055-01	003-SB-058-01	003-SB-DP1-04
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/24/97	09/24/97	08/04/97	08/24/97	08/19/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC50	AOC50	AOC54	AOC55	AOC58	AOC58
FIELD DUPLICATE OF:		003-SB-050-01				003-SB-058-01

METALS (mg/kg)

NICKEL	18.2	14.3	10.6 J	8.5	32.6	31.2
POTASSIUM	309	334	341 J	505 J	297	288
SELENIUM	0.21 UJ	0.21 U	0.19 UR	0.84 UJ	1.3 J	0.8 J
SILVER	0.63 U	0.63 U	0.59 U	0.63 U	0.64 U	0.67 U
SODIUM	99.3 J	94.8 J	74.3 J	113 J	106 J	109 J
THALLIUM	0.21 U	0.21 U	0.19 UJ	0.17 U	0.31 U	0.28 U
VANADIUM	15.2 J	16 J	11.4	10.9 J	33.5 J	35.6 J
ZINC	27.3 J	24.7 J	15.9 J	14.8 U	25 J	25.7 J

GENERAL CHEMISTRY

PH	8.9					
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)						
1,1,1-TRICHLOROETHANE	28	110 U	100 U	110 U	1 J	11 U
1,1,2,2-TETRACHLOROETHANE	11 U	110 U	100 U	110 U	11 U	11 U
1,1,2-TRICHLOROETHANE	11 U	110 U	100 U	110 U	11 U	11 U
1,1-DICHLOROETHANE	11 U	110 U	100 U	110 U	11 U	11 U
1,1-DICHLOROETHENE	11 U	110 U	100 U	110 U	11 U	11 U
1,2-DICHLOROETHANE	11 U	110 U	100 U	110 U	11 UJ	11 U
1,2-DICHLOROETHENE (TOTAL)	11 U	110 U	100 U	110 U	15	11 U
1,2-DICHLOROPROPANE	11 U	110 U	100 U	110 U	11 U	11 U
2-BUTANONE	3 J	110 U	100 U	110 U	4 J	5 J
2-HEXANONE	11 U	110 U	100 U	110 U	11 U	11 U
4-METHYL-2-PENTANONE	1 J	31 J	100 U	58 J	2 J	2 J
ACETONE	21	340	100 U	110 U	26 U	22 U
BENZENE	11 U	110 U	100 U	110 U	11 U	11 U
BROMODICHLOROMETHANE	11 U	110 U	100 U	110 U	11 U	11 U
BROMOFORM	11 U	110 U	100 U	110 U	11 U	11 UJ
BROMOMETHANE	11 U	110 U	100 U	110 U	11 U	11 U
CARBON DISULFIDE	11 U	110 U	100 U	110 U	11 U	11 U
CARBON TETRACHLORIDE	11 U	110 U	100 U	110 U	11 U	11 U
CHLOROBENZENE	11 U	110 U	100 U	110 U	11 U	11 U
CHLOROETHANE	11 U	110 U	100 U	110 UJ	11 UJ	11 U
CHLOROFORM	11 U	110 U	100 U	110 U	11 U	11 U
CHLOROMETHANE	11 UJ	110 U	100 U	110 U	11 UJ	11 U
CIS-1,3-DICHLOROPROPENE	11 U	110 U	100 U	110 U	11 U	11 U
DIBROMOCHLOROMETHANE	11 U	110 U	100 U	110 U	11 U	11 U
ETHYLBENZENE	11 U	110 U	100 U	110 U	11 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	18 U	110 U	100 U	110 U	11 U	11 U
STYRENE	11 U	110 U	100 U	110 U	11 U	11 U
TETRACHLOROETHENE	18	110 U	100 U	110 U	3 J	2 J
TOLUENE	1 J	110 U	100 U	13 U	1 J	11 U
TRANS-1,3-DICHLOROPROPENE	11 U	110 U	100 U	110 U	11 U	11 U
TRICHLOROETHENE	4 J	110 U	7 J	110 U	110	3 J
VINYL CHLORIDE	11 U	110 U	100 U	110 U	11 U	11 U
XYLENES, TOTAL	1 J	110 U	100 U	110 U	1 J	11 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
1,2-DICHLOROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
1,3-DICHLOROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
1,4-DICHLOROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
2,4,5-TRICHLOROPHENOL	880 U	930 U	860 U	910 U	920 U	900 U
2,4,6-TRICHLOROPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
2,4-DICHLOROPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
2,4-DIMETHYLPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
2,4-DINITROPHENOL	880 U	930 U	860 U	910 U	920 U	900 U
2,4-DINITROTOLUENE	350 U	370 U	340 U	360 U	370 U	360 U
2,6-DINITROTOLUENE	350 U	370 U	340 U	360 U	370 U	360 U
2-CHLORONAPHTHALENE	350 U	370 U	340 U	360 U	370 U	360 U
2-CHLOROPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
2-METHYLNAPHTHALENE	350 U	370 U	340 U	360 U	370 U	360 U
2-METHYLPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
2-NITROANILINE	880 U	930 U	860 U	910 U	920 U	900 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
3,3'-DICHLOROBENZIDINE	350 U	370 U	340 U	360 UJ	370 U	360 UJ
3-NITROANILINE	880 U	930 U	860 U	910 U	920 U	900 UJ
4,6-DINITRO-2-METHYLPHENOL	880 U	930 U	860 U	910 U	920 U	900 U
4-BROMOPHENYL PHENYL ETHER	350 U	370 U	340 U	360 U	370 U	360 U
4-CHLORO-3-METHYLPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
4-CHLOROANILINE	350 U	370 U	340 U	360 U	370 U	360 U
4-CHLOROPHENYL PHENYL ETHER	350 U	370 U	340 U	360 U	370 U	360 U
4-METHYLPHENOL	350 U	370 U	340 U	360 U	370 U	360 U
4-NITROANILINE	880 U	930 U	860 U	910 U	920 U	900 UJ
4-NITROPHENOL	880 U	930 U	860 U	910 U	970 U	900 U
ACENAPHTHENE	350 U	370 U	340 U	360 U	370 U	360 U
ACENAPHTHYLENE	350 U	370 U	340 U	360 U	370 U	360 U
ANTHRACENE	350 U	370 U	340 U	360 U	370 U	360 U
BENZO(A)ANTHRACENE	350 U	370 U	340 U	360 U	370 U	360 U
BENZO(A)PYRENE	350 U	370 U	340 U	360 U	370 U	360 U
BENZO(B)FLUORANTHENE	350 U	370 U	340 U	360 U	370 U	360 U
BENZO(G,H,I)PERYLENE	350 U	370 U	340 U	360 U	12 J	360 U
BENZO(K)FLUORANTHENE	350 U	370 U	340 U	360 U	370 U	360 U
BIS(2-CHLOROETHOXY)METHANE	350 U	370 U	340 U	360 U	370 U	360 U
BIS(2-CHLOROETHYL)ETHER	350 U	370 U	340 U	360 U	370 U	360 U
BIS(2-CHLOROISOPROPYL) ETHER	350 U	370 U	340 U	360 U	370 U	360 U
BIS(2-ETHYLHEXYL)PHTHALATE	350 U	370 U	340 U	360 U	370 U	360 U
BUTYLBENZYL PHTHALATE	350 U	370 U	340 U	360 U	370 U	360 U
CARBAZOLE	350 U	370 U	340 U	360 U	370 U	360 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	350 U	370 U	340 U	360 U	370 U	360 U
DI-N-BUTYL PHTHALATE	27 J	470 U	340 U	360 U	370 U	360 U
DI-N-OCTYL PHTHALATE	350 U	370 U	340 U	360 U	40 J	360 U
DIBENZO(A,H)ANTHRACENE	350 U	370 U	340 U	360 U	370 U	360 U
DIBENZOFURAN	350 U	370 U	340 U	360 U	370 U	360 U
DIETHYL PHTHALATE	350 U	370 U	340 U	360 U	370 U	360 U
DIMETHYL PHTHALATE	350 U	370 U	340 U	360 U	370 U	360 U
FLUORANTHENE	350 U	370 U	340 U	360 U	12 J	360 U
FLUORENE	350 U	370 U	340 U	360 U	370 U	360 U
HEXACHLOROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
HEXACHLOROBUTADIENE	350 U	370 U	340 U	360 U	370 U	360 U
HEXACHLOROCYCLOPENTADIENE	350 U	370 U	340 U	360 U	370 U	360 U
HEXACHLOROETHANE	350 U	370 U	340 U	360 U	370 U	360 U
INDENO(1,2,3-CD)PYRENE	350 U	370 U	340 U	360 U	370 U	360 U
ISOPHORONE	350 U	370 U	340 U	360 U	370 U	360 U
N-NITROSO-DI-N-PROPYLAMINE	350 U	370 U	340 U	360 U	370 U	360 U
N-NITROSODIPHENYLAMINE	350 U	370 U	340 U	360 U	370 U	360 U
NAPHTHALENE	350 U	370 U	340 U	360 U	370 U	360 U
NITROBENZENE	350 U	370 U	340 U	360 U	370 U	360 U
PENTACHLOROPHENOL	880 U	930 U	860 U	910 U	920 U	900 U
PHENANTHRENE	350 U	370 U	340 U	360 U	370 U	360 U
PHENOL	350 U	370 U	340 U	360 U	370 U	360 U
PYRENE	350 U	370 U	340 U	360 U	12 J	360 U
PYRIDINE	350 U	370 U	340 U	360 U	370 UJ	360 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	35 U	37 U	34 U	36 U	36 U	35 U
AROCLOR-1221	69 U	73 U	68 U	72 U	72 U	71 U
AROCLOR-1232	35 U	37 U	34 U	36 U	36 U	35 U
AROCLOR-1242	35 U	37 U	34 U	36 U	36 U	35 U
AROCLOR-1248	35 U	37 U	34 U	36 U	36 U	35 U
AROCLOR-1254	35 U	37 U	34 U	36 U	36 U	35 U
AROCLOR-1260	35 U	37 U	34 U	36 U	36 U	35 U

METALS (mg/kg)

ALUMINUM	2430	3790	2710 J	5000 J	4140 J	4770
ANTIMONY	3.1 UJ	2.6 UJ	2.8 UJ	2.6 UJ	3.1 J	3.1 UR
ARSENIC	0.68	2.4 J	1.7	13.8	2.6 J	2.5 J
BARIUM	10 J	82.8	18.7 J	43.5 J	79.6 J	56.9 J
BERYLLIUM	0.18 U	0.19	0.11 U	0.33	0.19 U	0.25 U
CADMIUM	0.33 U	0.32 U	0.35 U	0.33 U	0.31 U	0.33 U
CALCIUM	13400 J	1610	6530 J	13200 J	6600 J	5100 J
CHROMIUM	7.2 J	9.4 J	5.9	11.6	9	8.9
COBALT	3.9 J	7.2	5.1	8.6	7.6	6.8 J
COPPER	5.5	10.9	8 J	40.1	8.1 J	9
CYANIDE	0.26 U	0.28 U	0.26 U	0.27 U	0.27 U	0.27 U
HEXAVALENT CHROMIUM	2 U		2 U	2 U		
IRON	6160 J	13600 J	6470 J	27700 J	13500 J	8750 J
LEAD	3.1 J	3.8 J	2.6 J	10.8 J	4.9 J	4.4
MAGNESIUM	5790 J	1940 J	3420 J	7570 J	4020 J	2130 J
MANGANESE	74.1 J	881 J	180 J	580 J	829 J	661 J
MERCURY	0.04 U	0.05 U	0.04 U	0.04 U	0.05 U	0.04 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-063-01	003-SB-068-01	003-SB-070-01	003-SB-071-01	003-SB-073-01	003-SB-074-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97	07/27/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC63	AOC68	AOC70	AOC71	AOC73	AOC74
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	8 J	16.8	10.8	20.7	13.5 J	13.4 J
POTASSIUM	280 J	295	207	349	436 J	476 J
SELENIUM	0.19 UR	0.18 UJ	0.18 UJ	0.15 UJ	0.16 UJ	0.2 UR
SILVER	0.49 U	0.49 U	0.53 U	0.49 U	0.47 U	0.5 U
SODIUM	107 J	94.4 J	110	166 J	80.3 J	92.4 J
THALLIUM	0.19 U	0.18 J	0.18 U	0.15 U	0.17 U	0.2 UJ
VANADIUM	10.4	17.7	12	26.5	15.8 J	15
ZINC	15.1 J	21.5 J	14.7 J	34 J	23.9 J	18.4 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON	1200 J	1100 J	940 J			
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	100 U	100 U	100 U	25 U	11 U
1,1,2,2-TETRACHLOROETHANE	11 U	100 U	100 U	100 UJ	25 U	11 U
1,1,2-TRICHLOROETHANE	11 U	100 U	100 U	100 U	25 U	11 U
1,1-DICHLOROETHANE	11 U	100 U	100 U	100 U	25 U	11 U
1,1-DICHLOROETHENE	11 U	100 U	100 U	100 U	25 U	11 U
1,2-DICHLOROETHANE	11 U	100 U	100 U	100 U	25 U	11 U
1,2-DICHLOROETHENE (TOTAL)	11 U	100 U	100 U	100 U	25 U	11 U
1,2-DICHLOROPROPANE	11 U	100 U	100 U	100 U	25 U	11 UJ
2-BUTANONE	9 J	190	100	100 U	25 U	17 J
2-HEXANONE	11 U	100 UJ	100 U	100 U	25 U	11 UJ
4-METHYL-2-PENTANONE	2 J	120	49 J	100 U	25 U	2 J
ACETONE	59 U	280 U	770 J	100 U	170 J	91 J
BENZENE	11 U	100 U	100 U	100 U	25 U	11 U
BROMODICHLOROMETHANE	11 U	100 U	100 U	100 U	25 U	11 U
BROMOFORM	11 UJ	100 U	100 U	100 U	25 U	11 U
BROMOMETHANE	11 U	100 U	100 UJ	100 U	25 U	11 U
CARBON DISULFIDE	11 U	100 U	100 U	100 U	25 U	1 J
CARBON TETRACHLORIDE	11 U	100 U	100 U	100 U	25 U	11 U
CHLOROBENZENE	11 U	100 U	100 U	100 U	25 U	11 U
CHLOROETHANE	11 U	100 UJ	100 UJ	100 U	25 UJ	11 UJ
CHLOROFORM	11 U	100 U	100 U	100 U	25 U	11 U
CHLOROMETHANE	11 U	100 U	100 U	100 U	25 U	11 UJ
CIS-1,2-DICHLOROETHENE						11 U
CIS-1,3-DICHLOROPROPENE	11 U	100 U	100 U	100 U	25 U	11 U
DIBROMOCHLOROMETHANE	11 U	100 U	100 U	100 U	25 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

VOLATILES (µg/kg)

ETHYLBENZENE	11 U	100 U	10 J	100 U	25 U	1 J
METHYLENE CHLORIDE	11 U	100 U	100 U	100 U	25 U	18 U
STYRENE	11 U	100 U	33 J	100 U	25 U	11 U
TETRACHLOROETHENE	11 UJ	100 U	100 U	100 U	25 U	11 U
TOLUENE	2 J	100 U	7 J	100 U	25 U	1 J
TRANS-1,2-DICHLOROETHENE						11 U
TRANS-1,3-DICHLOROPROPENE	11 U	100 U	100 U	100 U	25 U	11 U
TRICHLOROETHENE	11 U	100 U	100 U	100 UJ	3 J	1 J
VINYL CHLORIDE	11 U	100 U	100 U	100 U	25 U	11 UJ
XYLENES, TOTAL	1 J	100 U	45 J	100 U	4 J	3 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	360 U			330 U	340 U	350 U
1,2-DICHLOROBENZENE	360 U			330 U	340 U	350 U
1,3-DICHLOROBENZENE	360 U			330 U	340 U	350 U
1,4-DICHLOROBENZENE	360 U			330 U	340 U	350 U
2,4,5-TRICHLOROPHENOL	900 U			830 U	840 U	890 U
2,4,6-TRICHLOROPHENOL	360 U			330 U	340 U	350 U
2,4-DICHLOROPHENOL	360 U			330 U	340 U	350 U
2,4-DIMETHYLPHENOL	360 U			330 U	340 U	350 U
2,4-DINITROPHENOL	900 U			830 U	840 U	350 U
2,4-DINITROTOLUENE	360 U			330 U	340 U	350 U
2,6-DINITROTOLUENE	360 U			330 U	340 U	350 U
2-CHLORONAPHTHALENE	360 U			330 U	340 U	350 U
2-CHLOROPHENOL	360 U			330 U	340 U	350 U
2-METHYLNAPHTHALENE	360 U			330 U	340 U	78 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	360 U			330 U	340 U	350 U
2-NITROANILINE	900 U			830 U	840 U	890 U
2-NITROPHENOL	360 U			330 U	340 U	350 U
3,3'-DICHLOROBENZIDINE	360 UJ			330 U	340 U	350 U
3-NITROANILINE	900 UJ			830 U	840 U	890 U
4,6-DINITRO-2-METHYLPHENOL	900 U			830 U	840 U	890 U
4-BROMOPHENYL PHENYL ETHER	360 U			330 U	340 U	350 U
4-CHLORO-3-METHYLPHENOL	360 U			330 U	340 U	350 U
4-CHLOROANILINE	360 U			330 U	340 U	350 U
4-CHLOROPHENYL PHENYL ETHER	360 U			330 U	340 U	350 U
4-METHYLPHENOL	360 U			330 U	340 U	350 U
4-NITROANILINE	900 UJ			830 U	840 U	890 UJ
4-NITROPHENOL	900 U			830 U	840 U	890 UJ
ACENAPHTHENE	360 U			330 U	37 J	380
ACENAPHTHYLENE	360 U			330 U	340 U	19 J
ANTHRACENE	360 U			330 U	51 J	610
BENZO(A)ANTHRACENE	360 U			330 U	180 J	3500
BENZO(A)PYRENE	360 U			330 U	130 J	1500
BENZO(B)FLUORANTHENE	360 U			330 U	170 J	3600
BENZO(G,H,I)PERYLENE	360 U			330 U	47 J	820
BENZO(K)FLUORANTHENE	360 U			330 U	120 J	910
BIS(2-CHLOROETHOXY)METHANE	360 U			330 U	340 U	350 U
BIS(2-CHLOROETHYL)ETHER	360 U			330 U	340 U	350 U
BIS(2-CHLOROISOPROPYL) ETHER	360 U			330 U	340 U	350 U
BIS(2-ETHYLHEXYL)PHTHALATE	360 U			330 U	20 J	380 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	360 U			330 U	340 U	350 U
CARBAZOLE	360 U			330 U	35 J	530
CHRYSENE	360 U			330 U	170 J	1600
DI-N-BUTYL PHTHALATE	360 U			330 U	340 U	13 J
DI-N-OCTYL PHTHALATE	360 U			330 U	12 J	350 U
DIBENZO(A,H)ANTHRACENE	360 U			330 U	340 U	370
DIBENZOFURAN	360 U			330 U	340 U	150 J
DIETHYL PHTHALATE	360 U			330 U	340 U	350 U
DIMETHYL PHTHALATE	360 U			330 U	340 UJ	350 U
FLUORANTHENE	360 U			330 U	390	5200
FLUORENE	360 U			330 U	23 J	290 J
HEXACHLORO BENZENE	360 U			330 U	340 U	350 U
HEXACHLOROBUTADIENE	360 U			330 U	340 U	350 U
HEXACHLOROCYCLOPENTADIENE	360 U			330 U	340 U	350 U
HEXACHLOROETHANE	360 U			330 U	340 U	350 U
INDENO(1,2,3-CD)PYRENE	360 U			330 U	86 J	1100
ISOPHORONE	360 U			330 U	340 U	350 U
N-NITROSO-DI-N-PROPYLAMINE	360 U			330 U	340 U	350 U
N-NITROSODIPHENYLAMINE	360 U			330 U	340 U	350 U
NAPHTHALENE	360 U			330 U	340 U	78 J
NITROBENZENE	360 U			330 U	340 U	350 U
PENTACHLOROPHENOL	900 U			830 U	840 U	350 U
PHENANTHRENE	360 U			330 U	300 J	5000
PHENOL	360 U			330 U	45 J	350 U
PYRENE	360 U			330 U	290 J	4800

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

SEMIVOLATILES (µg/kg)

PYRIDINE	360 U			330 U	340 U	350 UJ
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PCBs (µg/kg)

AROCLOR-1016	35 U			33 U	33 U	35 U
AROCLOR-1221	71 U			66 U	67 U	70 U
AROCLOR-1232	35 U			33 U	33 U	35 U
AROCLOR-1242	35 U			33 U	33 U	35 U
AROCLOR-1248	35 U			33 U	33 U	35 U
AROCLOR-1254	35 U			33 U	33 U	35 U
AROCLOR-1260	35 U			33 U	33 U	35 U

METALS (mg/kg)

ALUMINUM	4520			4270	3020 J	5120 J
ANTIMONY	3.6 UR			3.2 J	3.4 UR	3 UJ
ARSENIC	2.1 J			0.56	1.5	3.1 J
BARIUM	48.1 J			14.4 J	57.1 J	61.2 J
BERYLLIUM	0.27 U			0.23 U	0.16 U	0.25
CADMIUM	0.38 U			0.33 U	0.36 U	0.31 U
CALCIUM	6090 J			18400 J	1580 J	6900 J
CHROMIUM	11.2			15.1 J	7.2 J	10.9
COBALT	6.6 J			7 J	5.4 J	7 J
COPPER	10.8			4.7	3	14.5
CYANIDE	0.27 U			0.25 U	0.25 U	0.27 U
IRON	9500 J			8560 J	6460 J	10900 J
LEAD	4.1			2.9 J	3.3 J	21
MAGNESIUM	2670 J			8710 J	1640 J	3520 J
MANGANESE	505 J			219 J	327 J	561 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-02	003-SB-30D-01	003-SB-32D-01	003-SB-P01-01	003-SB-P02-01	003-SB-P03-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 5.0'	0.0 - 5.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	07/27/97	10/23/97	12/08/97	08/07/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-30D	MS-32D	P01	P02	P03
FIELD DUPLICATE OF:	003-SB-074-01					

METALS (mg/kg)

MERCURY	0.05 U			0.04 U	0.04 U	0.1 U
NICKEL	15.3 J			12.3 J	11.6	14.7
POTASSIUM	595 J			369 J	383	456 J
SELENIUM	0.19 UR			0.94 UR	0.2 UJ	0.17 U
SILVER	0.57 U			0.49 U	0.54 U	0.47 U
SODIUM	74.5 J			104 J	76.6 J	165
THALLIUM	0.19 UJ			0.19 U	0.2 UJ	0.17 U
VANADIUM	15.5			19.7	9.6 J	16.3
ZINC	23.6 J			20.1 J	18.7 J	35.6 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	100 U	51 U	11 U	100 U	100 U
1,1,2,2-TETRACHLOROETHANE	110 U	100 U	51 UJ	11 U	100 U	100 U
1,1,2-TRICHLOROETHANE	110 U	100 U	51 U	11 U	100 U	100 U
1,1-DICHLOROETHANE	110 U	100 U	51 U	11 U	100 U	100 U
1,1-DICHLOROETHENE	110 U	100 U	51 U	11 U	100 U	100 U
1,2-DICHLOROETHANE	110 U	100 U	51 U	11 U	100 U	100 U
1,2-DICHLOROETHENE (TOTAL)	110 U	100 U	51 U	11 U	100 U	100 U
1,2-DICHLOROPROPANE	110 U	100 U	51 U	11 UJ	100 U	100 U
2-BUTANONE	74 J	74 J	8 J	5 J	100 U	100 U
2-HEXANONE	110 U	100 U	51 U	11 UJ	100 U	100 U
4-METHYL-2-PENTANONE	85 J	100 U	51 U	11 UJ	29 J	100 U
ACETONE	180	140	81 U	36 J	170	100 U
BENZENE	110 U	100 U	51 U	11 U	100 U	100 U
BROMODICHLOROMETHANE	110 U	100 U	51 U	11 U	100 U	100 U
BROMOFORM	110 U	100 U	51 U	11 U	100 U	100 U
BROMOMETHANE	110 U	100 U	51 U	11 U	100 U	100 U
CARBON DISULFIDE	110 U	100 U	4 J	11 U	100 U	100 U
CARBON TETRACHLORIDE	110 U	100 U	51 U	11 U	100 U	100 U
CHLOROBENZENE	110 U	100 U	51 U	11 U	100 U	100 U
CHLOROETHANE	110 U	100 UJ	51 U	11 UJ	100 U	100 U
CHLOROFORM	110 U	100 U	51 U	11 U	100 U	100 U
CHLOROMETHANE	110 U	100 U	51 U	11 UJ	100 U	100 U
CIS-1,2-DICHLOROETHENE				11 U		
CIS-1,3-DICHLOROPROPENE	110 U	100 U	51 U	11 U	100 U	100 U
DIBROMOCHLOROMETHANE	110 U	100 U	51 U	11 U	100 U	100 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

ETHYLBENZENE	110 U	100 U	51 U	11 U	100 U	100 U
METHYLENE CHLORIDE	100 U	100 U	51 U	11 U	100 U	210 U
STYRENE	110 U	100 U	51 U	11 U	100 U	100 U
TETRACHLOROETHENE	110 U	100 U	51 U	11 U	100 U	100 U
TOLUENE	110 U	17 U	51 U	11 U	100 U	9 J
TRANS-1,2-DICHLOROETHENE				11 U		
TRANS-1,3-DICHLOROPROPENE	110 U	100 U	51 U	11 U	100 U	100 U
TRICHLOROETHENE	110 U	100 U	51 UJ	1 J	100 U	100 U
VINYL CHLORIDE	110 U	100 U	51 U	11 UJ	100 U	100 U
XYLENES, TOTAL	110 U	100 U	51 U	11 U	100 U	6 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
1,2-DICHLOROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
1,3-DICHLOROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
1,4-DICHLOROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
2,4,5-TRICHLOROPHENOL	890 U	850 U	840 U	910 U	850 U	830 U
2,4,6-TRICHLOROPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
2,4-DICHLOROPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
2,4-DIMETHYLPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
2,4-DINITROPHENOL	890 U	850 U	840 U	360 U	850 U	830 U
2,4-DINITROTOLUENE	350 U	340 U	340 U	360 U	340 U	330 U
2,6-DINITROTOLUENE	350 U	340 U	340 U	360 U	340 U	330 U
2-CHLORONAPHTHALENE	350 U	340 U	340 U	360 U	340 U	330 U
2-CHLOROPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
2-METHYLNAPHTHALENE	350 U	340 U	340 U	360 U	340 U	330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
2-NITROANILINE	890 U	850 U	840 U	910 U	850 U	830 U
2-NITROPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
3,3'-DICHLOROBENZIDINE	350 U	340 UJ	340 U	360 U	340 U	330 U
3-NITROANILINE	890 U	850 U	840 U	910 U	850 U	830 U
4,6-DINITRO-2-METHYLPHENOL	890 U	850 U	840 U	910 U	850 U	830 U
4-BROMOPHENYL PHENYL ETHER	350 U	340 U	340 U	360 U	340 U	330 U
4-CHLORO-3-METHYLPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
4-CHLOROANILINE	350 U	340 U	340 U	360 U	340 U	330 U
4-CHLOROPHENYL PHENYL ETHER	350 U	340 U	340 U	360 U	340 U	330 U
4-METHYLPHENOL	350 U	340 U	340 U	360 U	340 U	330 U
4-NITROANILINE	890 U	850 U	840 U	910 UJ	850 U	830 UJ
4-NITROPHENOL	890 U	850 U	840 U	910 UJ	850 U	830 U
ACENAPHTHENE	350 U	340 U	340 U	360 U	340 U	330 U
ACENAPHTHYLENE	350 U	340 U	340 U	360 U	340 U	330 U
ANTHRACENE	350 U	340 U	340 U	360 U	340 U	330 U
BENZO(A)ANTHRACENE	350 U	340 U	340 U	360 U	340 U	330 U
BENZO(A)PYRENE	350 U	340 U	340 U	360 U	340 U	330 U
BENZO(B)FLUORANTHENE	350 U	340 U	340 U	360 U	340 U	330 U
BENZO(G,H,I)PERYLENE	350 U	340 U	340 U	360 U	340 U	330 U
BENZO(K)FLUORANTHENE	350 U	340 U	340 U	360 U	340 U	330 U
BIS(2-CHLOROETHOXY)METHANE	350 U	340 U	340 U	360 U	340 U	330 U
BIS(2-CHLOROETHYL)ETHER	350 U	340 U	340 U	360 U	340 U	330 U
BIS(2-CHLOROISOPROPYL) ETHER	350 U	340 U	340 U	360 U	340 U	330 U
BIS(2-ETHYLHEXYL)PHTHALATE	350 U	340 U	340 U	360 U	340 U	26 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	350 U	340 U	16 J	360 U	340 U	330 U
CARBAZOLE	350 U	340 U	340 U	360 U	340 U	330 U
CHRYSENE	350 U	340 U	340 U	360 U	340 U	330 U
DI-N-BUTYL PHTHALATE	350 U	340 U	340 U	360 U	340 U	330 U
DI-N-OCTYL PHTHALATE	350 U	340 U	340 U	360 U	340 U	330 U
DIBENZO(A,H)ANTHRACENE	350 U	340 U	340 U	360 U	340 U	330 U
DIBENZOFURAN	350 U	340 U	340 U	360 U	340 U	330 U
DIETHYL PHTHALATE	350 U	340 U	340 U	360 U	340 U	330 U
DIMETHYL PHTHALATE	350 U	340 U	340 U	360 U	340 U	330 U
FLUORANTHENE	350 U	340 U	340 U	360 U	340 U	330 U
FLUORENE	350 U	340 U	340 U	360 U	340 U	330 U
HEXACHLOROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
HEXACHLOROBUTADIENE	350 U	340 U	340 U	360 U	340 U	330 U
HEXACHLOROCYCLOPENTADIENE	350 U	340 U	340 U	360 U	340 U	330 U
HEXACHLOROETHANE	350 U	340 U	340 U	360 U	340 U	330 U
INDENO(1,2,3-CD)PYRENE	350 U	340 U	340 U	360 U	340 U	330 U
ISOPHORONE	350 U	340 U	340 U	360 U	340 U	330 U
N-NITROSO-DI-N-PROPYLAMINE	350 U	340 U	340 U	360 U	340 U	330 U
N-NITROSODIPHENYLAMINE	350 U	340 U	340 U	360 U	340 U	330 U
NAPHTHALENE	350 U	340 U	340 U	360 U	340 U	330 U
NITROBENZENE	350 U	340 U	340 U	360 U	340 U	330 U
PENTACHLOROPHENOL	890 U	850 UJ	840 U	360 U	850 U	830 U
PHENANTHRENE	350 U	340 U	340 U	360 U	340 U	330 U
PHENOL	350 U	340 U	340 U	360 U	340 U	330 U
PYRENE	350 U	340 U	340 U	360 U	340 U	330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

PYRIDINE	350 U	340 U	340 U	360 UJ	340 U	330 UJ
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PCBs (µg/kg)

AROCLOR-1016	35 U	34 U	33 U	36 U	34 U	33 U
AROCLOR-1221	70 U	67 U	67 U	72 U	67 U	66 U
AROCLOR-1232	35 U	34 U	33 U	36 U	34 U	33 U
AROCLOR-1242	35 U	34 U	33 U	36 U	34 U	33 U
AROCLOR-1248	35 U	34 U	33 U	36 U	34 U	33 U
AROCLOR-1254	35 U	34 U	33 U	36 U	34 U	33 U
AROCLOR-1260	35 U	34 U	33 U	36 U	34 U	33 U

METALS (mg/kg)

ALUMINUM	2550 J	2800 J	2270	2640 J	2450 J	1900 J
ANTIMONY	3.2 UJ	3 UJ	3.5 UJ	3.4 UJ	2.7 UJ	3.6 UJ
ARSENIC	1.1	1.5	1.6	0.29 U	1	0.9 J
BARIUM	28.5 J	22.6 J	11.9 J	10.5 J	14.5 J	7.3 J
BERYLLIUM	0.12 U	0.15	0.13 U	0.11	0.15 U	0.15
CADMIUM	0.4 U	0.38 U	0.37 U	0.36 U	0.34 U	0.38 U
CALCIUM	3810 J	12900 J	18600 J	1830 J	1900 J	13400 J
CHROMIUM	7.2	7.8	8.9 J	9.6	6.8	6.1
COBALT	3.1	5.7	6 J	3.3 J	4.1	3.5 U
COPPER	4.8 U	6.6	1.4	0.99	2.7 U	2.1
CYANIDE	0.26 U	0.26 U	0.25 U	0.27 U	0.25 U	0.25 U
IRON	6070 J	7420 J	5430 J	3950 J	5020 J	4980 J
LEAD	2.6 J	3.4 J	2.2 J	3.1	4.1 J	1.9
MAGNESIUM	1910 J	5470 J	5260 J	1260 J	1550 J	6360 J
MANGANESE	171 J	234 J	192 J	31.3 J	68.6 J	196 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-01	003-SB-P05-01	003-SB-P06-01	003-SB-P07-01	003-SB-P08-01	003-SB-P09-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	07/10/97	09/02/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P07	P08	P09
FIELD DUPLICATE OF:						

METALS (mg/kg)

MERCURY	0.04 U	0.04 U	0.04 U	0.09 U	0.04 U	0.04 U
NICKEL	6.4	11.6	10 J	5.1	7.7	9.2
POTASSIUM	174	273	196 J	231 J	210	187 J
SELENIUM	0.21 UJ	0.19 UJ	0.16 UR	0.19 U	0.19 U	0.18 UJ
SILVER	0.59 U	0.56 U	0.55 U	0.54 U	0.5 U	0.56 U
SODIUM	69	79.6 J	78.1 J	70.1	43.6	59.5 J
THALLIUM	0.21 U	0.23	0.16 U	0.19 UJ	0.19 U	0.18 U
VANADIUM	10.8	10.1	8.3	9.6	10.2	7.3 J
ZINC	12 J	19.6 J	11.8 J	11.2 J	13.9 J	12.7 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 UJ	100 U	100 U	110 U	110 U	11 U
1,1,2,2-TETRACHLOROETHANE	100 U	100 U	100 U	110 U	110 U	11 U
1,1,2-TRICHLOROETHANE	100 U	100 U	100 U	110 U	110 U	11 U
1,1-DICHLOROETHANE	100 UJ	100 U	100 U	110 U	110 U	11 U
1,1-DICHLOROETHENE	100 UJ	100 U	100 U	110 U	110 U	11 U
1,2-DICHLOROETHANE	100 U	100 U	100 U	110 U	110 U	11 U
1,2-DICHLOROETHENE (TOTAL)	100 U	100 U	100 U	110 U	110 U	11 U
1,2-DICHLOROPROPANE	100 U	100 U	100 U	110 U	110 U	11 U
2-BUTANONE	100 UJ	100 U	40 J	110 U	93 J	2 J
2-HEXANONE	100 U	100 U	100 U	110 U	26 J	11 U
4-METHYL-2-PENTANONE	100 U	43 J	56 J	110 U	110	11 U
ACETONE	100 UJ	160	130	110 U	150 U	8 J
BENZENE	100 U	100 U	100 U	110 U	110 U	11 U
BROMODICHLOROMETHANE	100 U	100 U	100 U	110 U	110 U	11 U
BROMOFORM	100 U	100 U	100 U	110 U	110 U	11 U
BROMOMETHANE	100 UJ	100 U	100 U	110 U	110 U	11 U
CARBON DISULFIDE	100 UJ	100 U	100 U	6 J	110 U	11 U
CARBON TETRACHLORIDE	100 UJ	100 U	100 U	110 U	110 U	11 U
CHLOROBENZENE	100 U	100 U	100 U	110 U	110 U	11 U
CHLOROETHANE	100 UJ	100 U	100 U	110 U	110 U	11 U
CHLOROFORM	100 UJ	100 U	100 U	110 U	110 U	11 U
CHLOROMETHANE	100 UJ	100 U	100 U	110 U	110 U	11 UJ
CIS-1,3-DICHLOROPROPENE	100 U	100 U	100 U	110 U	110 U	11 U
DIBROMOCHLOROMETHANE	100 U	100 U	100 U	110 U	110 U	11 U
ETHYLBENZENE	100 U	100 U	100 U	110 U	110 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

VOLATILES (µg/kg)

METHYLENE CHLORIDE	180 U	100 U	100 U	110 U	100 U	11 U
STYRENE	100 U	100 U	100 U	110 U	110 U	11 U
TETRACHLOROETHENE	100 U	100 U	100 U	110 U	110 U	11 U
TOLUENE	100 U	100 U	100 U	110 U	110 U	1 J
TRANS-1,3-DICHLOROPROPENE	100 U	100 U	100 U	110 U	110 U	11 U
TRICHLOROETHENE	100 U	100 U	100 U	110 U	110 U	11 U
VINYL CHLORIDE	100 UJ	100 U	100 U	110 U	110 U	11 U
XYLENES, TOTAL	100 U	100 U	100 U	110 U	110 U	11 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	370 U	360 U	350 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	370 U	360 U	350 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	370 U	360 U	350 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	370 U	360 U	350 U
2,4,5-TRICHLOROPHENOL	840 U	860 U	860 U	920 U	910 U	880 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
2,4-DINITROPHENOL	840 U	860 U	860 U	920 U	910 U	350 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	370 U	360 U	350 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	370 U	360 U	350 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	370 U	360 U	350 U
2-CHLOROPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
2-METHYLNAPHTHALENE	340 U	340 U	340 U	370 U	360 U	350 U
2-METHYLPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
2-NITROANILINE	840 U	860 U	860 U	920 U	910 U	880 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	370 U	360 U	350 UJ
3-NITROANILINE	840 U	860 U	860 U	920 U	910 U	880 U
4,6-DINITRO-2-METHYLPHENOL	840 U	860 U	860 U	920 U	910 U	880 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	370 U	360 U	350 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
4-CHLOROANILINE	340 U	340 U	340 U	370 U	360 U	350 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	370 U	360 U	350 U
4-METHYLPHENOL	340 U	340 U	340 U	370 U	360 U	350 U
4-NITROANILINE	840 UJ	860 U	860 U	920 U	910 U	880 UJ
4-NITROPHENOL	840 U	860 U	860 U	920 U	910 U	880 U
ACENAPHTHENE	340 U	340 U	340 U	370 U	360 U	350 U
ACENAPHTHYLENE	340 U	340 U	340 U	370 U	360 U	350 U
ANTHRACENE	340 U	340 U	340 U	370 U	360 U	350 U
BENZO(A)ANTHRACENE	340 U	340 U	340 U	370 U	360 U	350 U
BENZO(A)PYRENE	340 U	340 U	340 U	370 U	360 U	350 U
BENZO(B)FLUORANTHENE	340 U	340 U	340 U	370 U	360 U	350 U
BENZO(G,H,I)PERYLENE	340 U	340 U	340 U	370 U	360 U	350 U
BENZO(K)FLUORANTHENE	340 U	340 U	340 U	370 U	360 U	350 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	370 U	360 U	350 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	370 U	360 U	350 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 U	370 U	360 U	350 U
BIS(2-ETHYLHEXYL)PHTHALATE	22 J	340 U	340 U	370 U	510 U	36 U
BUTYLBENZYL PHTHALATE	340 U	340 U	340 U	370 U	360 U	350 U
CARBAZOLE	340 U	340 U	340 U	370 U	360 U	350 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

SEMIVOLATILES (µg/kg)

CHRYSENE	340 U	340 U	340 U	370 U	360 U	350 U
DI-N-BUTYL PHTHALATE	340 U	340 U	340 U	370 U	360 U	350 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	370 U	360 U	350 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	370 U	360 U	350 U
DIBENZOFURAN	340 U	340 U	340 U	370 U	360 U	350 U
DIETHYL PHTHALATE	340 U	340 U	340 U	370 U	360 U	350 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	370 U	360 U	350 U
FLUORANTHENE	340 U	340 U	340 U	370 U	360 U	350 U
FLUORENE	340 U	340 U	340 U	370 U	360 U	350 U
HEXACHLORO BENZENE	340 U	340 U	340 U	370 U	360 U	350 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	370 U	360 U	350 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	340 U	370 U	360 U	350 U
HEXACHLOROETHANE	340 U	340 U	340 U	370 U	360 U	350 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	340 U	370 U	360 U	350 U
ISOPHORONE	340 U	340 U	340 U	370 U	360 U	350 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	370 U	360 U	350 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	370 U	360 U	350 U
NAPHTHALENE	340 U	340 U	340 U	370 U	360 U	350 U
NITROBENZENE	340 U	340 U	340 U	370 U	360 U	350 U
PENTACHLOROPHENOL	840 U	860 U	860 U	920 U	910 U	350 U
PHENANTHRENE	340 U	340 U	340 U	370 U	360 U	350 U
PHENOL	340 U	340 U	340 U	370 U	360 U	350 U
PYRENE	340 U	340 U	340 U	370 U	360 U	350 U
PYRIDINE	340 UJ	340 U	340 U	370 UJ	360 UJ	350 UJ

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

PCBs (µg/kg)

AROCLOR-1016	33 U	34 U	34 U	36 U	36 U	35 U
AROCLOR-1221	67 U	68 U	68 U	72 U	72 U	69 U
AROCLOR-1232	33 U	34 U	34 U	36 U	36 U	35 U
AROCLOR-1242	33 U	34 U	34 U	36 U	36 U	35 U
AROCLOR-1248	33 U	34 U	34 U	36 U	36 U	35 U
AROCLOR-1254	33 U	34 U	34 U	36 U	36 U	35 U
AROCLOR-1260	33 U	34 U	34 U	36 U	36 U	35 U

METALS (mg/kg)

ALUMINUM	2020 J	3530 J	4040 J	4290 J	4380 J	2320 J
ANTIMONY	3.4 UJ	3.1 UJ	2.8 UJ	2.8 J	2.4 UJ	3.2 UJ
ARSENIC	0.62	2.3	2.9	4.3	4	1.9 J
BARIUM	7.3 J	73.2 J	87.1 J	90.8 J	86.8 J	10.6 J
BERYLLIUM	0.16	0.18 U	0.16 U	0.2 U	0.23 J	0.12
CADMIUM	0.36 U	0.39 U	0.35 U	0.28 U	0.31 U	0.33 U
CALCIUM	15200 J	957 J	992 J	1200 J	1900 J	8830 J
CHROMIUM	6.4	6	6.8	6.5	7.9	7.9 J
COBALT	2.9 J	4.5	5.7	5.9	6	5.3
COPPER	0.8	2.4 U	3.6 U	3.1 J	8.1 J	9.5
CYANIDE	0.25 U	0.26 U	0.26 U	0.27 UJ	0.27 UJ	0.26 U
IRON	5210 J	9050 J	10100 J	13600 J	13900 J	4130 J
LEAD	1.9	2.6 J	2.8 J	2.7	2.6	3.4 J
MAGNESIUM	7170 J	1130 J	1250 J	1270 J	1450 J	3810 J
MANGANESE	211 J	826 J	1070 J	1300 J	1170 J	66.2 J
MERCURY	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NICKEL	7.2	8.5	10.1	9.8	12.7	9.9

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP1-05	003-SB-P10-01	003-SB-DP1-06	003-SB-P11-01	003-SB-DP1-07	003-SB-P12-01
DEPTH (feet):	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'	0.0 - 4.0'
SAMPLE DATE:	08/23/97	09/05/97	09/05/97	09/08/97	09/08/97	08/10/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P09	P10	P10	P11	P11	P12
FIELD DUPLICATE OF:	003-SB-P09-01		003-SB-P10-01		003-SB-P11-01	

METALS (mg/kg)

POTASSIUM	169 U	292	345	268	273	318 J
SELENIUM	0.17 UJ	0.19 UJ	0.19 UJ	0.2 UJ	0.2 U	0.16 UJ
SILVER	0.54 U	0.59 U	0.52 U	0.43 U	0.46 U	0.5 U
SODIUM	57.8 J	37.8	36.7	50.1 J	55 J	114 J
THALLIUM	0.17 U	0.19 U	0.19 U	0.2 U	0.2 U	0.16 UR
VANADIUM	8.2 J	10.6	12	14 J	14.9 J	8.3
ZINC	11.7 U	13 J	14.9 J	15.4 J	16.4 J	12.9 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	12 U	12 U	11 U	11 U		11 U
1,1,2,2-TETRACHLOROETHANE	12 U	12 U	11 U	11 U		11 U
1,1,2-TRICHLOROETHANE	12 U	12 U	11 U	11 U		11 U
1,1-DICHLOROETHANE	12 U	12 U	11 U	11 U		11 U
1,1-DICHLOROETHENE	12 U	12 U	11 U	11 U		11 U
1,2-DICHLOROETHANE	12 U	12 U	11 U	11 U		11 U
1,2-DICHLOROETHENE (TOTAL)	8	12 U	11 U	11 U		11 U
1,2-DICHLOROPROPANE	12 U	12 U	11 U	11 U		11 U
2-BUTANONE	12 U	12 U	11 U	11 U		5
2-HEXANONE	12 U	12 U	11 U	11 U		11 U
4-METHYL-2-PENTANONE	12 U	12 U	11 U	11 U		11 U
ACETONE	24 U	110 U	31 U	26 U		15 U
BENZENE	12 U	12 U	11 U	11 U		11 U
BROMODICHLOROMETHANE	12 U	12 U	11 U	11 U		11 U
BROMOFORM	12 U	12 U	11 U	11 U		11 U
BROMOMETHANE	12 U	12 U	11 U	11 U		11 U
CARBON DISULFIDE	12 U	12 U	11 U	11 U		11 U
CARBON TETRACHLORIDE	12 U	12 U	11 U	11 U		11 U
CHLOROBENZENE	12 U	12 U	11 U	11 U		11 U
CHLOROETHANE	12 U	12 U	11 U	11 U		11 U
CHLOROFORM	12 U	12 U	11 U	11 U		11 U
CHLOROMETHANE	12 U	12 U	11 U	11 U		11 U
CIS-1,3-DICHLOROPROPENE	12 U	12 U	11 U	11 U		11 U
DIBROMOCHLOROMETHANE	12 U	12 U	11 U	11 U		11 U
ETHYLBENZENE	12 U	12 U	11 U	11 U		11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

VOLATILES (µg/kg)

METHYLENE CHLORIDE	12 U	12 U	11 U	11 U		11 U
STYRENE	12 U	12 U	11 U	11 U		9
TETRACHLOROETHENE	12 U	12 U	11 U	90		11 U
TOLUENE	1	12 U	11 U	11 U		11 U
TRANS-1,3-DICHLOROPROPENE	12 U	12 U	11 U	11 U		11 U
TRICHLOROETHENE	640	12	130	71		14
VINYL CHLORIDE	12 U	12 U	11 U	11 U		11 U
XYLENES, TOTAL	12 U	12 U	11 U	4		11 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
1,2-DICHLOROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
1,3-DICHLOROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
1,4-DICHLOROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
2,2'-OXYBIS(1-CHLOROPROPANE)	350 U	340 U	340 U	330 U	340 U	350 U
2,4,5-TRICHLOROPHENOL	850 U	830 U	810 U	810 U	820 U	850 U
2,4,6-TRICHLOROPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
2,4-DICHLOROPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
2,4-DIMETHYLPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
2,4-DINITROPHENOL	850 U	830 U	810 U	810 U	820 U	850 U
2,4-DINITROTOLUENE	350 U	340 U	340 U	330 U	340 U	350 U
2,6-DINITROTOLUENE	350 U	340 U	340 U	330 U	340 U	350 U
2-CHLORONAPHTHALENE	350 U	340 U	340 U	330 U	340 U	350 U
2-CHLOROPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
2-METHYLNAPHTHALENE	350 U	340 U	340 U	330 U	340 U	350 U
2-METHYLPHENOL	350 U	340 U	340 U	330 U	340 U	350 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

SEMIVOLATILES (µg/kg)

2-NITROANILINE	850 U	830 U	810 U	810 U	820 U	850 U
2-NITROPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
3,3'-DICHLOROBENZIDINE	350 U	340 U	340 U	330 U	340 U	350 U
3-NITROANILINE	850 U	830 U	810 U	810 U	820 U	850 U
4,6-DINITRO-2-METHYLPHENOL	850 U	830 U	810 U	810 U	820 U	850 U
4-BROMOPHENYL PHENYL ETHER	350 U	340 U	340 U	330 U	340 U	350 U
4-CHLORO-3-METHYLPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
4-CHLOROANILINE	350 U	340 U	340 U	330 U	340 U	350 U
4-CHLOROPHENYL PHENYL ETHER	350 U	340 U	340 U	330 U	340 U	350 U
4-METHYLPHENOL	350 U	340 U	340 U	330 U	340 U	350 U
4-NITROANILINE	850 U	830 U	810 U	810 U	820 U	850 U
4-NITROPHENOL	850 U	830 U	810 U	810 U	820 U	850 U
ACENAPHTHENE	350 U	340 U	340 U	330 U	340 U	350 U
ACENAPHTHYLENE	350 U	340 U	340 U	330 U	340 U	350 U
ANTHRACENE	350 U	340 U	340 U	330 U	340 U	350 U
BENZO(A)ANTHRACENE	350 U	340 U	340 U	330 U	340 U	350 U
BENZO(A)PYRENE	350 U	340 U	340 U	330 U	340 U	350 U
BENZO(B)FLUORANTHENE	350 U	340 U	340 U	330 U	340 U	350 U
BENZO(G,H,I)PERYLENE	350 U	340 U	340 U	330 U	340 U	350 U
BENZO(K)FLUORANTHENE	350 U	340 U	340 U	330 U	340 U	350 U
BIS(2-CHLOROETHOXY)METHANE	350 U	340 U	340 U	330 U	340 U	350 U
BIS(2-CHLOROETHYL)ETHER	350 U	340 U	340 U	330 U	340 U	350 U
BIS(2-ETHYLHEXYL)PHTHALATE	160	700	56	920	1200	350 U
BUTYLBENZYL PHTHALATE	350 U	340 U	340 U	330 U	340 U	350 U
CARBAZOLE	350 U	340 U	340 U	330 U	340 U	350 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

SEMIVOLATILES (µg/kg)

CHRYSENE	350 U	340 U	340 U	330 U	340 U	350 U
DI-N-BUTYL PHTHALATE	350 U	340 U	340 U	330 U	340 U	350 U
DI-N-OCTYL PHTHALATE	350 U	340 U	340 U	330 U	340 U	350 U
DIBENZO(A,H)ANTHRACENE	350 U	340 U	340 U	330 U	340 U	350 U
DIBENZOFURAN	350 U	340 U	340 U	330 U	340 U	350 U
DIETHYL PHTHALATE	350 U	340 U	340 U	330 U	340 U	350 U
DIMETHYL PHTHALATE	350 U	340 U	340 U	330 U	340 U	350 U
FLUORANTHENE	350 U	340 U	340 U	330 U	340 U	350 U
FLUORENE	350 U	340 U	340 U	330 U	340 U	350 U
HEXACHLOROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
HEXACHLOROBUTADIENE	350 U	340 U	340 U	330 U	340 U	350 U
HEXACHLOROCYCLOPENTADIENE	350 U	340 U	340 U	330 U	340 U	350 U
HEXACHLOROETHANE	350 U	340 U	340 U	330 U	340 U	350 U
INDENO(1,2,3-CD)PYRENE	350 U	340 U	340 U	330 U	340 U	350 U
ISOPHORONE	350 U	340 U	340 U	330 U	340 U	350 U
N-NITROSO-DI-N-PROPYLAMINE	350 U	340 U	340 U	330 U	340 U	350 U
N-NITROSODIPHENYLAMINE	350 U	340 U	340 U	330 U	340 U	350 U
NAPHTHALENE	350 U	340 U	340 U	330 U	340 U	350 U
NITROBENZENE	350 U	340 U	340 U	330 U	340 U	350 U
PENTACHLOROPHENOL	850 U	830 U	810 U	810 U	820 U	850 U
PHENANTHRENE	350 U	340 U	340 U	330 U	340 U	350 U
PHENOL	350 U	340 U	340 U	330 U	340 U	350 U
PYRENE	350 U	340 U	340 U	52	50	350 U

PCBs (µg/kg)

AROCLOR-1016	35 U	34 U	34 U	170 U	170 U	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

PCBs (µg/kg)

AROCLOR-1221	71 U	70 U	68 U	340 U	340 U	
AROCLOR-1232	35 U	34 U	34 U	170 U	170 U	
AROCLOR-1242	35 U	34 U	34 U	170 U	170 U	
AROCLOR-1248	35 U	34 U	34 U	170 U	170 U	
AROCLOR-1254	35 U	34 U	34 U	170 U	170 U	
AROCLOR-1260	35 U	34 U	34 U	170 U	170 U	

METALS (mg/kg)

ALUMINUM	4820	3660	3310	525	498	2590
ANTIMONY	8.8 U	8.9 U	8 U	8.6 U	9.4 U	8.8 U
ARSENIC	2.1	4.1	2.1	0.42	0.32 U	5.8
BARIUM	32.6	37	28.1	19.5	13.8	201
BERYLLIUM	0.18 U	0.29	0.19	0.17 U	0.16 U	0.21
CADMIUM	0.53 U	0.53 U	1.8 U	1 U	0.79 U	2.6 U
CALCIUM	14100	17400	12100	882	768	4260
CHROMIUM	17.9	19.5	20	72.3	73.6	13.4
COBALT	5.4	3.7	4	1.5 U	1.5 U	6.9
COPPER	13	14.6	14.9	24.9	17.9	13.9
CYANIDE	0.99 U	0.94 U	0.89 U	79	90.4	1.1
IRON	10400	13400	8990	2990	2430	14600
LEAD	6	6.1	12.1	215	175	7.6
MAGNESIUM	4700	5800	5080	211	153	1880
MANGANESE	307	364	403	61.3	31.2	2490
MERCURY	0.04 U	0.04 U	0.04 U	0.05 U	0.04 U	0.05 U
NICKEL	19.6	19.7	27.4	7.9 U	4.6 U	14.7
POTASSIUM	550	417	380	147	157	268

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-01-0001	DUP-01	SB-02-0001	SB-02-0204	DUP-02	SB-03-0001
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 1.0'	2.0 - 4.0'	2.0 - 4.0'	0.0 - 1.0'
SAMPLE DATE:	04/10/95	04/10/95	04/11/95	04/11/95	04/11/95	04/05/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-01/TW-01	SB-01/TW-01	SB-02	SB-02	SB-02	SB-03
FIELD DUPLICATE OF:		SB-01-0001			SB-02-0204	

METALS (mg/kg)

SELENIUM	0.71 U	0.71 U	0.64 U	0.69 U	0.64 U	0.71 U
SILVER	0.88 U	0.89 U	0.8 U	0.86 U	0.81 U	0.88 U
SODIUM	333	316	142	103	86	259
THALLIUM	0.88 U	0.89 U	0.8 U	0.86 U	0.81 U	0.88 U
VANADIUM	15.2	17.6	12	2	2.3	10.1
ZINC	21.4	19	24.9	8.5 U	8.9 U	26.4

GENERAL CHEMISTRY

PH	11.51	11.42	10.93	6.85	6.89	9.47
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-04-0001	SB-05-0001	SB-06-0002			
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 2.0'			
SAMPLE DATE:	04/06/95	04/06/95	04/04/95	//	//	//
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING			
LOCATION:	SB-04/TW-02	SB-05	SB-06/TW-03			
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	11 U	11 U			
1,1,2,2-TETRACHLOROETHANE	11 U	11 U	11 U			
1,1,2-TRICHLOROETHANE	11 U	11 U	11 U			
1,1-DICHLOROETHANE	11 U	11 U	11 U			
1,1-DICHLOROETHENE	11 U	11 U	11 U			
1,2-DICHLOROETHANE	11 U	11 U	11 U			
1,2-DICHLOROETHENE (TOTAL)	11 U	11 U	11 U			
1,2-DICHLOROPROPANE	11 U	11 U	11 U			
2-BUTANONE	11 U	11 U	11 U			
2-HEXANONE	11 U	11 U	11 U			
4-METHYL-2-PENTANONE	11 U	11 U	11 U			
ACETONE	38 U	14 U	280			
BENZENE	11 U	11 U	11 U			
BROMODICHLOROMETHANE	11 U	11 U	11 U			
BROMOFORM	11 U	11 U	11 U			
BROMOMETHANE	11 U	11 U	11 U			
CARBON DISULFIDE	11 U	11 U	11 U			
CARBON TETRACHLORIDE	11 U	11 U	11 U			
CHLOROBENZENE	11 U	11 U	11 U			
CHLOROETHANE	11 U	11 U	11 U			
CHLOROFORM	11 U	11 U	11 U			
CHLOROMETHANE	11 U	11 U	11 U			
CIS-1,3-DICHLOROPROPENE	11 U	11 U	11 U			
DIBROMOCHLOROMETHANE	11 U	11 U	11 U			
ETHYLBENZENE	11 U	11 U	11 U			

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-04-0001	SB-05-0001	SB-06-0002			
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 2.0'			
SAMPLE DATE:	04/06/95	04/06/95	04/04/95	//	//	//
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING			
LOCATION:	SB-04/TW-02	SB-05	SB-06/TW-03			
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	11 U	11 U	11 U			
STYRENE	11 U	11 U	4			
TETRACHLOROETHENE	11 U	11 U	11 U			
TOLUENE	11 U	11 U	11 U			
TRANS-1,3-DICHLOROPROPENE	11 U	11 U	11 U			
TRICHLOROETHENE	16	9	7			
VINYL CHLORIDE	11 U	11 U	11 U			
XYLENES, TOTAL	11 U	11 U	11 U			

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U	360 U	340 U			
1,2-DICHLOROBENZENE	350 U	360 U	340 U			
1,3-DICHLOROBENZENE	350 U	360 U	340 U			
1,4-DICHLOROBENZENE	350 U	360 U	340 U			
2,2'-OXYBIS(1-CHLOROPROPANE)	350 U	360 U	340 U			
2,4,5-TRICHLOROPHENOL	840 U	870 U	820 U			
2,4,6-TRICHLOROPHENOL	350 U	360 U	340 U			
2,4-DICHLOROPHENOL	350 U	360 U	340 U			
2,4-DIMETHYLPHENOL	350 U	360 U	340 U			
2,4-DINITROPHENOL			820 U			
2,4-DINITROTOLUENE			340 U			
2,6-DINITROTOLUENE	350 U	360 U	340 U			
2-CHLORONAPHTHALENE	350 U	360 U	340 U			
2-CHLOROPHENOL	350 U	360 U	340 U			
2-METHYLNAPHTHALENE	350 U	360 U	340 U			
2-METHYLPHENOL	350 U	360 U	340 U			

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-04-0001	SB-05-0001	SB-06-0002			
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 2.0'			
SAMPLE DATE:	04/06/95	04/06/95	04/04/95	//	//	//
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING			
LOCATION:	SB-04/TW-02	SB-05	SB-06/TW-03			
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE	840 U	870 U	820 U			
2-NITROPHENOL	350 U	360 U	340 U			
3,3'-DICHLOROBENZIDINE			340 U			
3-NITROANILINE	840 U	870 U	820 U			
4,6-DINITRO-2-METHYLPHENOL			820 U			
4-BROMOPHENYL PHENYL ETHER			340 U			
4-CHLORO-3-METHYLPHENOL	350 U	360 U	340 U			
4-CHLOROANILINE	350 U	360 U	340 U			
4-CHLOROPHENYL PHENYL ETHER			340 U			
4-METHYLPHENOL	350 U	360 U	340 U			
4-NITROANILINE			820 U			
4-NITROPHENOL			820 U			
ACENAPHTHENE	350 U	360 U	340 U			
ACENAPHTHYLENE	350 U	360 U	340 U			
ANTHRACENE			340 U			
BENZO(A)ANTHRACENE			340 U			
BENZO(A)PYRENE			340 U			
BENZO(B)FLUORANTHENE			340 U			
BENZO(G,H,I)PERYLENE			340 U			
BENZO(K)FLUORANTHENE			340 U			
BIS(2-CHLOROETHOXY)METHANE	350 U	360 U	340 U			
BIS(2-CHLOROETHYL)ETHER	350 U	360 U	340 U			
BIS(2-ETHYLHEXYL)PHTHALATE			340 U			
BUTYLBENZYL PHTHALATE			340 U			
CARBAZOLE			340 U			

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-04-0001	SB-05-0001	SB-06-0002			
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 2.0'			
SAMPLE DATE:	04/06/95	04/06/95	04/04/95	//	//	//
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING			
LOCATION:	SB-04/TW-02	SB-05	SB-06/TW-03			
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE			340 U			
DI-N-BUTYL PHTHALATE			340 U			
DI-N-OCTYL PHTHALATE			340 U			
DIBENZO(A,H)ANTHRACENE			340 U			
DIBENZOFURAN			340 U			
DIETHYL PHTHALATE			340 U			
DIMETHYL PHTHALATE	350 U	360 U	340 U			
FLUORANTHENE			340 U			
FLUORENE			340 U			
HEXACHLOROBENZENE			340 U			
HEXACHLOROBUTADIENE	350 U	360 U	340 U			
HEXACHLOROCYCLOPENTADIENE	350 U	360 U	340 U			
HEXACHLOROETHANE	350 U	360 U	340 U			
INDENO(1,2,3-CD)PYRENE			340 U			
ISOPHORONE	350 U	360 U	340 U			
N-NITROSO-DI-N-PROPYLAMINE	350 U	360 U	340 U			
N-NITROSODIPHENYLAMINE			340 U			
NAPHTHALENE	350 U	360 U	340 U			
NITROBENZENE	350 U	360 U	340 U			
PENTACHLOROPHENOL			820 U			
PHENANTHRENE			340 U			
PHENOL	350 U	360 U	340 U			
PYRENE			340 U			

METALS (mg/kg)

ALUMINUM	3490	3700	2790			
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 0 TO 4 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-04-0001	SB-05-0001	SB-06-0002			
DEPTH (feet):	0.0 - 1.0'	0.0 - 1.0'	0.0 - 2.0'			
SAMPLE DATE:	04/06/95	04/06/95	04/04/95	//	//	//
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING			
LOCATION:	SB-04/TW-02	SB-05	SB-06/TW-03			
FIELD DUPLICATE OF:						

METALS (mg/kg)

ANTIMONY	9.4 U	8.8 U	8.9 U			
ARSENIC	3.4	2.5	4.5			
BARIUM	67.3	37.5	21.9			
BERYLLIUM	0.23	0.26	0.25			
CADMIUM	0.57 U	0.53 U	0.54 U			
CALCIUM	6400	9790	19100			
CHROMIUM	10.2	15.9	27.9			
COBALT	5.3	4.9	7.2			
COPPER	14.7	21.4	9.6			
CYANIDE	1.1 U	1.1 U	1 U			
IRON	11700	10400	8570			
LEAD	9	32.6	2.6			
MAGNESIUM	2920	4410	6630			
MANGANESE	638	442	246			
MERCURY	0.04 U	0.05 U	0.05 U			
NICKEL	12.4 U	13.6 U	12.9 U			
POTASSIUM	382	413	285			
SELENIUM	0.75 U	0.71 U	0.71 U			
SILVER	0.94 U	0.88 U	0.89 U			
SODIUM	180	145	128			
THALLIUM	0.94 U	0.88 U	0.89 U			
VANADIUM	13.7	15.9	11.3			
ZINC	19.4	22.9	15.2			

GENERAL CHEMISTRY

PH	9.22	8.79	9.54			
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	11 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	10 U	11 U	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	11 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	11 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	11 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 UJ	10 U	11 U	10 U	10 UJ
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	11 U	10 U	10 U
1,2-DICHLOROPROPANE	10 UJ	10 U	10 UJ	11 U	10 U	10 U
2-BUTANONE	4 J	4 J	10 UJ	11 U	10 U	10 UJ
2-HEXANONE	10 UJ	10 U	10 UJ	11 U	10 U	10 U
4-METHYL-2-PENTANONE	1 J	2 J	10 UJ	11 U	10 U	10 U
ACETONE	29 J	40 U	8 J	62 J	10 UJ	10 U
BENZENE	10 U	10 U	10 U	1 J	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	11 U	10 U	10 U
BROMOFORM	10 U	10 U	10 U	11 U	10 U	10 U
BROMOMETHANE	10 U	10 U	10 U	11 U	10 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	11 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	11 U	10 U	10 U
CHLOROBENZENE	10 U	10 U	10 U	11 U	10 U	10 U
CHLOROETHANE	10 UJ	10 UJ	10 UJ	11 U	10 U	10 UJ
CHLOROFORM	10 U	10 U	10 U	11 U	10 U	10 U
CHLOROMETHANE	10 UJ	10 UJ	10 UJ	11 U	10 U	10 UJ
CIS-1,2-DICHLOROETHENE	10 U		10 U			
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	11 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	11 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

ETHYLBENZENE	10 U	10 U	10 U	11 U	10 U	10 U
METHYLENE CHLORIDE	12 U	10 U	10 U	11 U	10 U	10 U
STYRENE	10 U	10 U	10 U	11 U	10 U	10 U
TETRACHLOROETHENE	10 U	10 U	10 U	11 U	10 U	10 U
TOLUENE	10 U	1 J	10 U	2 J	10 U	10 U
TRANS-1,2-DICHLOROETHENE	10 U		10 U			
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	11 U	10 U	10 U
TRICHLOROETHENE	10 U	10 U	10 U	11 U	10 U	10 U
VINYL CHLORIDE	10 UJ	10 U	10 UJ	11 U	10 U	10 U
XYLENES, TOTAL	10 U	1 J	10 U	1 J	10 U	10 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	360 U		340 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	360 U		340 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	360 U		340 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	360 U		340 U
2,4,5-TRICHLOROPHENOL	850 U	840 U	860 U	900 U		850 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	360 U		340 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	360 U		340 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	360 U		340 U
2,4-DINITROPHENOL	340 U	840 U	340 U	900 U		850 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	360 U		340 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	360 U		340 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	360 U		340 U
2-CHLOROPHENOL	340 U	340 U	340 U	360 U		340 U
2-METHYLNAPHTHALENE	340 U	340 U	340 U	360 U		340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	340 U	340 U	340 U	360 U		340 U
2-NITROANILINE	850 U	840 U	860 U	900 U		850 U
2-NITROPHENOL	340 U	340 U	340 U	360 U		340 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	360 U		340 U
3-NITROANILINE	850 U	840 U	860 U	900 U		850 U
4,6-DINITRO-2-METHYLPHENOL	850 U	840 U	860 U	900 U		850 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	360 U		340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	360 U		340 U
4-CHLOROANILINE	340 U	340 U	340 U	360 U		340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	360 U		340 U
4-METHYLPHENOL	340 U	340 U	340 U	360 U		340 U
4-NITROANILINE	850 U	840 U	860 UJ	900 U		850 U
4-NITROPHENOL	850 U	840 U	860 U	900 U		850 U
ACENAPHTHENE	340 U	340 U	340 U	360 U		340 U
ACENAPHTHYLENE	340 U	340 U	340 U	360 U		340 U
ANTHRACENE	340 U	340 U	12 J	360 U		340 U
BENZO(A)ANTHRACENE	340 U	340 U	39 J	360 U		340 U
BENZO(A)PYRENE	340 U	340 U	33 J	360 U		340 U
BENZO(B)FLUORANTHENE	340 U	340 U	34 J	360 U		340 U
BENZO(G,H,I)PERYLENE	340 U	340 U	18 J	360 U		340 U
BENZO(K)FLUORANTHENE	340 U	340 U	30 J	360 U		340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	360 U		340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	360 U		340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 UJ	360 U		340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	340 U	340 U	19 J		370 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	340 U	340 U	110 J	360 U		340 U
CARBAZOLE	340 U	340 U	340 U	360 U		340 U
CHRYSENE	340 U	340 U	41 J	360 U		340 U
DI-N-BUTYL PHTHALATE	340 U	340 U	340 U	360 U		340 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	360 U		340 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	360 U		340 U
DIBENZOFURAN	340 U	340 U	340 U	360 U		340 U
DIETHYL PHTHALATE	340 U	340 U	340 U	360 U		340 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	360 U		340 U
FLUORANTHENE	340 U	340 U	88 J	360 U		340 U
FLUORENE	340 U	340 U	340 U	360 U		340 U
HEXACHLORO BENZENE	340 U	340 U	340 U	360 U		340 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	360 U		340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	340 U	360 UJ		340 U
HEXACHLOROETHANE	340 U	340 U	340 U	360 U		340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	20 J	360 U		340 U
ISOPHORONE	340 U	340 U	340 U	360 U		340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	360 U		340 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	360 U		340 U
NAPHTHALENE	340 U	340 U	340 U	360 U		340 U
NITROBENZENE	340 U	340 U	340 U	360 U		340 U
PENTACHLOROPHENOL	340 U	840 U	340 U	900 U		850 U
PHENANTHRENE	340 U	340 U	45 J	360 U		340 U
PHENOL	340 U	340 U	340 U	360 U		340 U
PYRENE	340 U	340 U	67 J	360 U		340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

PYRIDINE	340 UJ	340 U	340 UJ	360 U		340 UJ
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PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	34 U	35 U		34 U
AROCLOR-1221	67 U	67 U	68 U	71 U		67 U
AROCLOR-1232	34 U	33 U	34 U	35 U		34 U
AROCLOR-1242	34 U	33 U	34 U	35 U		34 U
AROCLOR-1248	34 U	33 U	34 U	35 U		34 U
AROCLOR-1254	34 U	33 U	34 U	35 U		34 U
AROCLOR-1260	34 U	33 U	34 U	35 U		34 U

METALS (mg/kg)

ALUMINUM	1930 J	1450 J	2370 J	4050 J		2500 J
ANTIMONY	3.5 UJ	3.4 UJ	3.4 UJ	3.5 UJ		3 UJ
ARSENIC	0.8 U	1.6	0.88 U	2.2		0.67
BARIUM	14.1 J	6.5 J	19.3 J	42.8 J		8.7 J
BERYLLIUM	0.06	0.07	0.07	0.22		0.17
CADMIUM	0.37 U	0.36 U	0.35 U	0.37 U		0.31 U
CALCIUM	5780 J	13800 J	18700 J	3440 J		3270 J
CHROMIUM	6.2	5.2	9.2	8.5		7.8
COBALT	3.1 U	2.8 J	4.3 J	6.5 J		4 J
COPPER	1.1	1.6 U	2.4	6.6		12.7 J
CYANIDE	0.26 U	0.25 U	0.26 U	0.27 U		0.25 U
HEXAVALENT CHROMIUM		2 U		2 U		2 U
IRON	5800 J	3520 J	5900 J	10200 J		7020 J
LEAD	1.9	1.2 J	2	7		1.3 U
MAGNESIUM	2620 J	3850 J	6990 J	2220 J		2100 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-003-02	003-SB-004-03	003-SB-006-03	003-SB-007-02	003-SB-007-03	003-SB-008-02
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	07/13/97	07/22/97	07/08/97	08/21/97	08/21/97	07/21/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC07	AOC08/AOC09
FIELD DUPLICATE OF:						

METALS (mg/kg)

MANGANESE	82.5 J	53.3 J	220 J	405 J		62.1 J
MERCURY	0.08 U	0.05 U	0.18 J	0.19 J		0.05 U
NICKEL	3.6	5	7.9	12.4		9.3
POTASSIUM	156 J	154 J	237 J	339 J		186 J
SELENIUM	0.19 U	0.4 J	0.17 U	0.18 UJ		0.16 UJ
SILVER	0.55 U	0.54 U	0.53 U	0.56 U		0.47 U
SODIUM	52.4	41.8 U	73	51.3 U		138 J
THALLIUM	0.19 U	0.16 U	0.17 UJ	0.18 U		0.19 U
VANADIUM	9.8	6.7 J	10	15.7 J		26.1 J
ZINC	9.1 J	8.6 U	13.3 J	23.2 J		12.5 U

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		2200 J	1100 J			
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	100 U	10 U	10 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	100 U	10 U	10 U	10 U	10 UJ
1,1,2-TRICHLOROETHANE	10 U	100 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	100 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	100 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	100 U	10 U	10 UJ	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	100 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 UJ	100 U	10 U	10 U	10 U	10 U
2-BUTANONE	1 J	100 U	6 J	2 J	5 J	4 J
2-HEXANONE	10 UJ	100 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 UJ	24 J	1 J	1 J	1 J	1 J
ACETONE	19 J	430	33 U	13 U	32 U	27
BENZENE	10 U	100 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	100 U	10 U	10 U	10 U	10 U
BROMOFORM	10 U	100 U	10 UJ	10 U	10 UJ	10 U
BROMOMETHANE	10 U	100 U	1 J	10 U	1 J	10 U
CARBON DISULFIDE	10 U	100 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	100 U	10 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	100 U	10 U	10 U	10 U	10 U
CHLOROETHANE	10 UJ	100 UJ	10 U	10 UJ	10 U	10 U
CHLOROFORM	10 U	100 U	10 U	10 U	10 U	10 U
CHLOROMETHANE	10 UJ	100 U	10 U	10 UJ	10 U	10 U
CIS-1,2-DICHLOROETHENE	10 U					
CIS-1,3-DICHLOROPROPENE	10 U	100 U	10 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	100 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

ETHYLBENZENE	10 U	100 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	10 U	100 U	10 U	10 U	10 U	10 U
STYRENE	10 U	100 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	10 U	100 U	10 UJ	1 J	10 UJ	10 U
TOLUENE	10 U	100 U	10 U	10 U	1 J	1 J
TRANS-1,2-DICHLOROETHENE	10 U					
TRANS-1,3-DICHLOROPROPENE	10 U	100 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	10 U	100 U	10 U	10 U	2 J	1 J
VINYL CHLORIDE	10 UJ	100 U	10 U	10 U	10 U	10 U
XYLENES, TOTAL	10 U	100 U	10 U	10 U	10 U	1 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	350 U	340 U	340 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	350 U	340 U	340 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	350 U	340 U	340 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	350 U	340 U	340 U
2,4,5-TRICHLOROPHENOL	850 U	840 U	850 U	870 U	850 U	850 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
2,4-DINITROPHENOL	340 U	840 U	850 U	870 U	850 U	340 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	350 U	340 U	340 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	350 U	340 U	340 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	350 U	340 U	340 U
2-CHLOROPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
2-METHYLNAPHTHALENE	340 U	340 U	340 U	350 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
2-NITROANILINE	850 U	840 U	850 U	870 U	850 U	850 U
2-NITROPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	350 U	340 UJ	340 UJ
3-NITROANILINE	850 U	840 U	850 U	870 U	850 UJ	850 U
4,6-DINITRO-2-METHYLPHENOL	850 U	840 U	850 U	870 U	850 U	850 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	350 U	340 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
4-CHLOROANILINE	340 U	340 U	340 U	350 U	340 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	350 U	340 U	340 U
4-METHYLPHENOL	340 U	340 U	340 U	350 U	340 U	340 U
4-NITROANILINE	850 U	840 U	850 U	870 U	850 UJ	850 UJ
4-NITROPHENOL	850 U	840 U	850 U	870 U	850 U	850 U
ACENAPHTHENE	340 U	340 U	340 U	350 U	340 U	340 U
ACENAPHTHYLENE	340 U	340 U	340 U	350 U	340 U	340 U
ANTHRACENE	340 U	340 U	340 U	350 U	340 U	340 U
BENZO(A)ANTHRACENE	18 J	340 U	340 U	350 U	340 U	340 U
BENZO(A)PYRENE	11 J	340 U	340 U	350 U	340 U	340 U
BENZO(B)FLUORANTHENE	14 J	340 U	340 U	350 U	340 U	340 U
BENZO(G,H,I)PERYLENE	340 U	340 U	340 U	350 U	340 U	340 U
BENZO(K)FLUORANTHENE	15 J	340 U	340 U	350 U	340 U	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	350 U	340 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	350 U	340 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 U	350 U	340 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U
CARBAZOLE	340 U	340 U	340 U	350 UJ	340 U	340 U
CHRYSENE	19 J	340 U	340 U	350 U	340 U	340 U
DI-N-BUTYL PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	350 U	340 U	340 U
DIBENZOFURAN	340 U	340 U	340 U	350 U	340 U	340 U
DIETHYL PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	350 U	340 U	340 U
FLUORANTHENE	43 J	340 U	340 U	12 J	340 U	340 U
FLUORENE	340 U	340 U	340 U	350 U	340 U	340 U
HEXACHLORO BENZENE	340 U	340 U	340 U	350 U	340 U	340 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	350 U	340 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	340 U	350 U	340 U	340 U
HEXACHLOROETHANE	340 U	340 U	340 U	350 U	340 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	340 U	350 U	340 U	340 U
ISOPHORONE	340 U	340 U	340 U	350 U	340 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	350 U	340 U	340 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	350 U	340 U	340 U
NAPHTHALENE	340 U	340 U	340 U	350 U	340 U	340 U
NITROBENZENE	340 U	340 U	340 U	350 U	340 U	340 U
PENTACHLOROPHENOL	340 U	840 U	850 U	870 U	850 U	340 U
PHENANTHRENE	28 J	340 U	340 U	350 U	340 U	340 U
PHENOL	340 U	340 U	340 U	350 U	340 U	340 U
PYRENE	46 J	340 U	340 U	11 J	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

PYRIDINE	340 UJ	340 U	340 UJ	350 UJ	340 U	340 UJ
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PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	34 U	34 U	34 U	34 U
AROCLOR-1221	67 U	67 U	67 U	69 U	67 U	67 U
AROCLOR-1232	34 U	33 U	34 U	34 U	34 U	34 U
AROCLOR-1242	34 U	33 U	34 U	34 U	34 U	34 U
AROCLOR-1248	34 U	33 U	34 U	34 U	34 U	34 U
AROCLOR-1254	34 U	33 U	34 U	34 U	34 U	34 U
AROCLOR-1260	34 U	33 U	34 U	34 U	34 U	34 U

METALS (mg/kg)

ALUMINUM	2300 J	1500	1970 J	2790 J	3060	1990 J
ANTIMONY	3 UJ	2.8 UJ	3.6 UJ	2.8 UJ	3.4 UR	2.6 UJ
ARSENIC	0.66 U	1.7 J	0.99 J	1.8 J	1.1 J	0.68 J
BARIUM	17.9 J	8.2	10.1 J	9.8 J	21 J	6.3 J
BERYLLIUM	0.1	0.07	0.17 J	0.12 U	0.13 U	0.14
CADMIUM	0.32 U	0.35 U	0.38 U	0.3 U	0.36 U	0.28 U
CALCIUM	12600 J	28700	29000 J	25400 J	30000 J	2630 J
CHROMIUM	7.5	5.8 J	7.3	11.6	10.2	5.7 J
COBALT	5.5 J	5.6	4.6	6	4.4 J	2.3
COPPER	4	1.6	2.3 U	5.8 J	6.4	5
CYANIDE	0.26 U	0.25 U	0.26 U	0.26 U	0.26 U	0.25 U
HEXAVALENT CHROMIUM	2 U	2 U		2 U	2 U	
IRON	5120 J	5180 J	5340 J	6690 J	6270 J	5040 J
LEAD	2.8	2.9 J	1.4 J	4.4 J	2.8	0.88 J
MAGNESIUM	4240 J	8630 J	9670 J	7710 J	9980 J	1340 J

Blank space Indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-013-02	003-SB-015-03	003-SB-016-03	003-SB-017-03	003-SB-018-02	003-SB-023-03
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'
SAMPLE DATE:	07/14/97	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC13/AOC14	AOC15	AOC16	AOC17	AOC18	AOC23
FIELD DUPLICATE OF:						

METALS (mg/kg)

MANGANESE	180 J	278 J	698 J	462 J	185 J	61.6 J
MERCURY	0.32 J	0.04 U	0.05 U	0.04 U	0.04 U	0.04 U
NICKEL	8.8	9.9	7.8 J	11.6 J	9.6 J	5.5
POTASSIUM	234 J	191	215 J	234 J	311 J	216 J
SELENIUM	0.17 U	0.17 UJ	0.18 UJ	0.18 UJ	0.16 UR	0.17 UJ
SILVER	0.48 U	0.53 U	0.56 U	0.45 U	0.54 U	0.41 U
SODIUM	41.9	58.4 J	71.2 J	62.4 J	140 J	74.1 U
THALLIUM	0.17 U	0.17 UJ	0.18 U	0.31 U	0.16 UJ	0.17 UR
VANADIUM	8.8	10.5	8.2 J	13.7 J	10.1	13.9
ZINC	13.7 J	11.6 J	12.6 J	14.2 J	17.4 J	9.4 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		1000 J	1400 J			
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
1,1,2,2-TETRACHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
1,1,2-TRICHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
1,1-DICHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
1,1-DICHLOROETHENE	100 U	51 U	51 U	100 U	100 U	51 U
1,2-DICHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
1,2-DICHLOROETHENE (TOTAL)	100 U	26 J	3 J	100 U	100 U	51 U
1,2-DICHLOROPROPANE	100 U	51 U	51 U	100 U	100 U	51 U
2-BUTANONE	41 J	86	51 U	100 U	87 J	18 J
2-HEXANONE	100 U	51 U	51 U	100 U	100 U	51 U
4-METHYL-2-PENTANONE	60 J	92	26 J	150	26 J	24 J
ACETONE	320	350	61	160 U	440	130
BENZENE	100 U	51 U	51 U	100 U	100 U	51 U
BROMODICHLOROMETHANE	100 U	51 U	51 U	100 U	100 U	51 U
BROMOFORM	100 U	51 U	51 U	100 U	100 U	51 U
BROMOMETHANE	100 U	51 U	51 U	100 U	100 U	51 U
CARBON DISULFIDE	8 J	51 U	51 U	100 U	100 U	51 U
CARBON TETRACHLORIDE	100 U	51 U	51 U	100 U	100 U	51 U
CHLOROBENZENE	100 U	51 U	51 U	100 U	100 U	51 U
CHLOROETHANE	100 U	51 U	51 U	100 U	100 U	51 U
CHLOROFORM	100 U	51 U	51 U	100 U	100 U	51 U
CHLOROMETHANE	100 U	51 U	51 U	100 U	100 U	51 U
CIS-1,3-DICHLOROPROPENE	100 U	51 U	51 U	100 U	100 U	51 U
DIBROMOCHLOROMETHANE	100 U	51 U	51 U	100 U	100 U	51 U
ETHYLBENZENE	100 U	4 J	51 U	100 U	100 U	51 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	100 U	51 U	51 U	100 U	100 U	51 U
STYRENE	100 U	51 U	51 U	100 U	100 U	51 U
TETRACHLOROETHENE	8 J	51 U	51 U	100 U	100 U	51 U
TOLUENE	100 U	8 J	51 U	100 U	100 U	51 U
TRANS-1,3-DICHLOROPROPENE	100 U	51 U	51 U	100 U	100 U	51 U
TRICHLOROETHENE	100 U	51 U	51 U	100 U	100 U	51 U
VINYL CHLORIDE	100 U	51 U	51 U	100 U	100 U	51 U
XYLENES, TOTAL	100 U	10 J	51 U	100 U	23 J	51 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
2,4,5-TRICHLOROPHENOL	850 U	840 U	840 U	840 U	860 U	840 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
2,4-DINITROPHENOL	850 U	840 U	840 U	840 U	860 U	840 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	340 U	340 U	340 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	340 U	340 U	340 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	340 U	340 U	340 U
2-CHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
2-METHYLNAPHTHALENE	34 J	340 U	340 U	13 J	340 U	340 U
2-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
2-NITROANILINE	850 U	840 U	840 U	840 U	860 U	840 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	340 U	340 U	340 U
3-NITROANILINE	850 U	840 U	840 U	840 U	860 U	840 U
4,6-DINITRO-2-METHYLPHENOL	850 U	840 U	840 U	840 U	860 U	840 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	340 U	340 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
4-CHLOROANILINE	340 U	340 U	340 U	340 U	340 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	340 U	340 U	340 U
4-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	340 U
4-NITROANILINE	850 U	840 U	840 U	840 U	860 U	840 U
4-NITROPHENOL	850 U	840 U	840 U	840 U	860 U	840 U
ACENAPHTHENE	340 U	340 U	340 U	340 U	340 U	340 U
ACENAPHTHYLENE	340 U	340 U	340 U	340 U	340 U	340 U
ANTHRACENE	340 U	340 U	340 U	340 U	340 U	340 U
BENZO(A)ANTHRACENE	340 U	340 U	340 U	340 U	340 U	340 U
BENZO(A)PYRENE	340 U	340 U	340 U	340 U	340 U	340 U
BENZO(B)FLUORANTHENE	340 U	340 U	340 U	340 U	340 U	340 U
BENZO(G,H,I)PERYLENE	340 U	340 U	340 U	340 U	340 U	340 U
BENZO(K)FLUORANTHENE	340 U	340 U	340 U	340 U	340 U	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	340 U	340 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	340 U	340 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 U	340 U	340 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	16 J	25 J	340 U	340 U	150 J
BUTYLBENZYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	340 U
CARBAZOLE	340 U	340 U	340 U	340 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	13 J	340 U	340 U	340 U	340 U	340 U
DI-N-BUTYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	340 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	84 J
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	340 U	340 U	340 U
DIBENZOFURAN	340 U	340 U	340 U	340 U	340 U	340 U
DIETHYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	340 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	340 U
FLUORANTHENE	20 J	340 U	340 U	340 U	340 U	340 U
FLUORENE	340 U	340 U	340 U	340 U	340 U	340 U
HEXACHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	340 U	340 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 UJ	340 UJ	340 U	340 U	340 U
HEXACHLOROETHANE	340 U	340 U	340 U	340 U	340 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	340 U	340 U	340 U	340 U
ISOPHORONE	340 U	340 U	340 U	340 U	340 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	340 U	340 U	340 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	340 U	340 U	340 U
NAPHTHALENE	110 J	340 U	340 U	340 U	340 U	340 U
NITROBENZENE	340 U	340 U	340 U	340 U	340 U	340 U
PENTACHLOROPHENOL	850 U	840 U	840 U	840 U	860 U	840 U
PHENANTHRENE	39 J	340 U	340 U	23 J	340 U	340 U
PHENOL	340 U	340 U	340 U	340 U	340 U	340 U
PYRENE	17 J	340 U	340 U	340 U	340 U	340 U
PYRIDINE	340 U	340 U	340 U	340 U	340 UJ	340 UJ

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	33 U	33 U	34 U	33 U
AROCLOR-1221	67 U	67 U	67 U	67 U	68 U	67 U
AROCLOR-1232	34 U	33 U	33 U	33 U	34 U	33 U
AROCLOR-1242	34 U	33 U	33 U	33 U	34 U	33 U
AROCLOR-1248	34 U	33 U	33 U	33 U	34 U	33 U
AROCLOR-1254	34 U	33 U	33 U	33 U	34 U	33 U
AROCLOR-1260	34 U	33 U	33 U	33 U	34 U	33 U

METALS (mg/kg)

ALUMINUM	2280	2340 J	2380 J	2980 J	1790 J	2400 J
ANTIMONY	3 UJ	3.3 UJ	3.1 UJ	2.6 UJ	2.7 UJ	3.5 UJ
ARSENIC	4.6 J	0.73	0.69	0.9 J	0.64	1.2
BARIUM	11.5	8.4 J	8.2 J	18.4 J	7 J	14.5 J
BERYLLIUM	0.11	0.14	0.13	0.21 U	0.13 U	0.15
CADMIUM	0.37 U	0.35 U	0.33 U	0.33 U	0.33 U	0.37 U
CALCIUM	3880	23700 J	21300 J	24700 J	1450 J	7610 J
CHROMIUM	6.7 J	9.4	12.1	8.2	3.7	10.3
COBALT	3.5	6.6 J	6.3 J	3.8	2.3	3.9 J
COPPER	2.8	10	6.2	19.1 J	5 J	6.9
CYANIDE	0.26 U	0.25 U	0.25 U	0.25 UJ	0.26 UJ	0.25 U
HEXAVALENT CHROMIUM					2 U	2 U
IRON	6050 J	5590 J	5700 J	9590 J	3400 J	5570 J
LEAD	9.5 J	2.4	2.4	3.2	1.2	1.6
MAGNESIUM	2330 J	6840 J	7310 J	7690 J	1190 J	3230 J
MANGANESE	37.8 J	96.2 J	111 J	211 J	35.2 J	119 J
MERCURY	0.04 U	0.31 J	0.23 J	0.04 U	0.04 U	0.04 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-026-03	003-SB-027-02	003-SB-027-03	003-SB-028-02	003-SB-029-02	003-SB-030-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	09/20/97	08/22/97	08/22/97	09/16/97	09/15/97	08/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC26	AOC27	AOC27	AOC28	AOC29	AOC30
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	5.3	12.7	12.1	8.9	4.9	8.5
POTASSIUM	202	242 J	246 J	254	216	315 J
SELENIUM	0.13 UJ	0.17 UJ	0.17 UJ	0.18 U	0.17 U	0.19 UJ
SILVER	0.56 U	0.52 U	0.5 U	0.49 U	0.5 U	0.56 U
SODIUM	75.2 J	88.6 J	74.5 J	153 J	73.7 J	129 J
THALLIUM	0.13 UJ	0.17 U	0.17 U	0.18 U	0.21 U	0.19 U
VANADIUM	14.9	14.1 J	11.4 J	13.2 J	8.9 J	14.4 J
ZINC	11.8 J	13.7 J	14.8 J	207 J	9.2 J	12.2 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		1700 J	2000 J	1300 J		750 J
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	190 U	100 U	10 U	2 J	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	190 U	100 U	10 U	10 U	10 UJ
1,1,2-TRICHLOROETHANE	10 U	190 U	100 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	11 J	100 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	190 U	100 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	190 U	100 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	15000	100 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 U	190 U	100 U	10 U	10 U	10 U
2-BUTANONE	10 U	190 U	100 U	18	4 J	6 J
2-HEXANONE	10 U	190 U	100 U	1 J	10 U	2 J
4-METHYL-2-PENTANONE	6 J	190 U	100 U	4 J	1 J	8 J
ACETONE	43	1700	100 U	60 U	35 U	18
BENZENE	10 U	24 J	100 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	190 U	100 U	10 U	10 U	10 U
BROMOFORM	10 U	190 U	100 U	10 U	10 UJ	10 U
BROMOMETHANE	10 U	190 U	100 U	10 U	10 U	10 U
CARBON DISULFIDE	10 U	11 J	100 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	190 U	100 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	190 U	100 U	10 U	10 U	10 U
CHLOROETHANE	10 U	190 U	100 U	10 U	10 U	10 U
CHLOROFORM	10 U	190 U	100 U	10 U	10 U	10 U
CHLOROMETHANE	10 U	190 U	100 U	10 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	190 U	100 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	190 U	100 U	10 U	10 U	10 U
ETHYLBENZENE	10 U	720	100 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	410 U	100 U	10 U	12 U	10 U
STYRENE	10 U	190 U	100 U	10 U	1 J	10 U
TETRACHLOROETHENE	10 U	390	100 U	10 U	2 J	10 U
TOLUENE	1 J	1000	100 U	2 J	2 J	1 J
TRANS-1,3-DICHLOROPROPENE	10 U	190 U	100 U	10 U	10 U	10 U
TRICHLOROETHENE	10 U	22 J	100 U	10 U	36	10 UJ
VINYL CHLORIDE	10 U	190 U	100 U	10 U	10 U	10 U
XYLENES, TOTAL	10 U	7300	100 U	1 J	1 J	1 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE		6200 U	340 U	350 U	350 U	
1,2-DICHLOROBENZENE		6200 U	340 U	350 U	350 U	
1,3-DICHLOROBENZENE		6200 U	340 U	350 U	350 U	
1,4-DICHLOROBENZENE		6200 U	340 U	350 U	350 U	
2,4,5-TRICHLOROPHENOL		15000 U	860 U	870 U	870 U	
2,4,6-TRICHLOROPHENOL		6200 U	340 U	350 U	350 U	
2,4-DICHLOROPHENOL		6200 U	340 U	350 U	350 U	
2,4-DIMETHYLPHENOL		6200 U	340 U	350 U	350 U	
2,4-DINITROPHENOL		15000 U	860 U	870 U	870 U	
2,4-DINITROTOLUENE		6200 U	340 U	350 U	350 U	
2,6-DINITROTOLUENE		6200 U	340 U	350 U	350 U	
2-CHLORONAPHTHALENE		6200 U	340 U	350 U	350 U	
2-CHLOROPHENOL		6200 U	340 U	350 U	350 U	
2-METHYLNAPHTHALENE		720 J	340 U	350 U	350 U	
2-METHYLPHENOL		6200 U	340 U	350 U	350 U	
2-NITROANILINE		15000 U	860 U	870 U	870 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL		6200 U	340 U	350 U	350 U	
3,3'-DICHLOROBENZIDINE		6200 U	340 U	350 UJ	350 UJ	
3-NITROANILINE		15000 U	860 U	870 UJ	870 UJ	
4,6-DINITRO-2-METHYLPHENOL		15000 U	860 U	870 U	870 U	
4-BROMOPHENYL PHENYL ETHER		6200 U	340 U	350 U	350 U	
4-CHLORO-3-METHYLPHENOL		11000	340 U	350 U	350 U	
4-CHLOROANILINE		6200 U	340 U	350 U	350 U	
4-CHLOROPHENYL PHENYL ETHER		6200 U	340 U	350 U	350 U	
4-METHYLPHENOL		6200 U	340 U	350 U	350 U	
4-NITROANILINE		15000 U	860 U	870 UJ	870 UJ	
4-NITROPHENOL		15000 U	860 U	870 U	870 U	
ACENAPHTHENE		6200 U	340 U	350 U	350 U	
ACENAPHTHYLENE		6200 U	340 U	350 U	350 U	
ANTHRACENE		510 J	340 U	350 U	350 U	
BENZO(A)ANTHRACENE		6200 U	340 U	350 U	350 U	
BENZO(A)PYRENE		6200 U	340 U	350 U	350 U	
BENZO(B)FLUORANTHENE		6200 U	340 U	350 U	350 U	
BENZO(G,H,I)PERYLENE		6200 U	340 U	350 U	350 U	
BENZO(K)FLUORANTHENE		6200 U	340 U	350 U	350 U	
BIS(2-CHLOROETHOXY)METHANE		6200 U	340 U	350 U	350 U	
BIS(2-CHLOROETHYL)ETHER		6200 U	340 U	350 U	350 U	
BIS(2-CHLOROISOPROPYL) ETHER		6200 U	340 U	350 U	350 U	
BIS(2-ETHYLHEXYL)PHTHALATE		1600 J	340 U	350 U	350 U	
BUTYLBENZYL PHTHALATE		3600 J	340 U	350 U	350 U	
CARBAZOLE		6200 U	340 U	350 U	350 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE		6200 U	340 U	350 U	350 U	
DI-N-BUTYL PHTHALATE		6200 U	340 U	350 U	350 U	
DI-N-OCTYL PHTHALATE		6200 U	340 U	350 U	350 U	
DIBENZO(A,H)ANTHRACENE		6200 U	340 U	350 U	350 U	
DIBENZOFURAN		6200 U	340 U	350 U	350 U	
DIETHYL PHTHALATE		6200 U	340 U	350 U	350 U	
DIMETHYL PHTHALATE		6200 UJ	340 U	350 U	350 U	
FLUORANTHENE		270 J	340 U	350 U	350 U	
FLUORENE		6200 U	340 U	350 U	350 U	
HEXACHLORO BENZENE		6200 U	340 U	350 U	350 U	
HEXACHLOROBUTADIENE		6200 U	340 U	350 U	350 U	
HEXACHLOROCYCLOPENTADIENE		6200 U	340 U	350 U	350 U	
HEXACHLOROETHANE		6200 U	340 U	350 U	350 U	
INDENO(1,2,3-CD)PYRENE		6200 U	340 U	350 U	350 U	
ISOPHORONE		6200 U	340 U	350 U	350 U	
N-NITROSO-DI-N-PROPYLAMINE		6200 U	340 U	350 U	350 U	
N-NITROSODIPHENYLAMINE		6200 U	340 U	350 U	350 U	
NAPHTHALENE		2300 J	340 U	350 U	350 U	
NITROBENZENE		6200 U	340 U	350 U	350 U	
PENTACHLOROPHENOL		15000 U	860 U	870 U	870 U	
PHENANTHRENE		490 J	340 U	350 U	350 U	
PHENOL		6200 U	340 U	350 U	350 U	
PYRENE		410 J	340 U	350 U	350 U	
PYRIDINE		6200 UJ	340 U	350 U	350 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016		61 U	34 U	34 U	34 U	
AROCLOR-1221		120 U	68 U	69 U	69 U	
AROCLOR-1232		61 U	34 U	34 U	34 U	
AROCLOR-1242		61 U	34 U	34 U	34 U	
AROCLOR-1248		61 U	34 U	34 U	34 U	
AROCLOR-1254		61 U	34 U	34 U	34 U	
AROCLOR-1260		61 U	34 U	34 U	34 U	

METALS (mg/kg)

ALUMINUM		4400 J	1620 J	1800	7090	
ANTIMONY		6 UJ	2.9 UJ	3.2 UR	3.8 UR	
ARSENIC		13.6	0.62	0.65 U	3.8 J	
BARIUM		70.4 J	6.3 J	6.9 J	67.6 J	
BERYLLIUM		0.28	0.09 U	0.13 U	0.44 J	
CADMIUM		0.63 U	0.36 U	0.34 U	0.4 U	
CALCIUM		10700 J	3030 J	1600 J	34500 J	
CHROMIUM		7.5	5	5.7	16	
COBALT		4.4 U	2.8	3 J	6.4 J	
COPPER		15.3	4.3 U	4.9	10.1	
CYANIDE		0.46 U	0.26 U	0.26 U	0.26 U	
HEXAVALENT CHROMIUM					2 U	2 U
IRON		23300 J	3410 J	4840 J	12000 J	
LEAD		10.8	1.3 J	1.6	6.4	
MAGNESIUM		1330 J	1530 J	1110 J	12900 J	
MANGANESE		179 J	47.2 J	48.4 J	476 J	
MERCURY		0.06	0.04 U	0.04 U	0.04 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-03	003-SB-032-03	003-SB-033-03	003-SB-034-03	003-SB-035-02	003-SB-036-02
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'
SAMPLE DATE:	08/23/97	08/25/97	09/07/97	07/29/97	07/28/97	08/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC32	AOC33	AOC34	AOC35	AOC36
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL		5.6	5.5	5.4 J	16.7 J	
POTASSIUM		777 J	179	218 J	1350 J	
SELENIUM		0.34 UJ	0.19 UJ	0.17 UR	0.17 UR	
SILVER		0.95 U	0.54 U	0.51 U	0.6 U	
SODIUM		267 J	68	77.6 J	141 J	
THALLIUM		0.34 U	0.19 U	0.17 UJ	0.17 UJ	
VANADIUM		35.3 J	9.4	16.3	28.4	
ZINC		28.7 J	8.7 J	9.8 U	39.6 J	

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON					1000 J	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	11 U	10 U	10 U	110 U	100 U
1,1,2,2-TETRACHLOROETHANE	10 UJ	11 U	10 UJ	10 U	110 U	100 U
1,1,2-TRICHLOROETHANE	10 U	11 U	10 U	10 U	110 U	100 U
1,1-DICHLOROETHANE	10 U	11 U	10 U	10 U	110 U	100 U
1,1-DICHLOROETHENE	10 U	11 U	10 U	10 U	110 U	100 U
1,2-DICHLOROETHANE	10 U	11 U	10 U	10 UJ	110 U	100 U
1,2-DICHLOROETHENE (TOTAL)	10 U	11 U	10 U	10 U	110 U	100 U
1,2-DICHLOROPROPANE	10 U	11 U	10 U	10 U	110 U	100 U
2-BUTANONE	8 J	11	41	15 J	110 U	100 U
2-HEXANONE	2 J	11 U	4 J	1 J	110 U	100 U
4-METHYL-2-PENTANONE	11	5 J	24	6 J	68 J	38 J
ACETONE	27	28	93	66 U	390	450
BENZENE	10 U	11 U	10 U	10 U	110 U	100 U
BROMODICHLOROMETHANE	10 U	11 U	10 U	10 U	110 U	100 U
BROMOFORM	10 U	11 U	10 U	10 U	110 U	100 U
BROMOMETHANE	10 U	11 U	10 U	10 U	110 U	100 U
CARBON DISULFIDE	10 U	11 U	10 U	10 U	110 U	100 U
CARBON TETRACHLORIDE	10 U	11 U	10 U	10 U	110 U	100 U
CHLOROBENZENE	10 U	11 U	10 U	10 U	110 U	100 U
CHLOROETHANE	10 U	11 U	10 U	10 UJ	110 U	100 UJ
CHLOROFORM	10 U	11 U	10 U	10 U	110 U	100 U
CHLOROMETHANE	10 U	11 UJ	10 U	10 UJ	110 U	100 U
CIS-1,3-DICHLOROPROPENE	10 U	11 U	10 U	10 U	110 U	100 U
DIBROMOCHLOROMETHANE	10 U	11 U	10 U	10 U	110 U	100 U
ETHYLBENZENE	10 U	11 U	10 U	10 U	110 U	100 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	11 U	10 U	10 U	110 U	100 U
STYRENE	10 U	11 U	10 U	10 U	110 U	100 U
TETRACHLOROETHENE	10 U	11 U	10 U	10 U	110 U	100 U
TOLUENE	1 J	1 J	1 J	1 J	19 J	100 U
TRANS-1,3-DICHLOROPROPENE	10 U	11 U	10 U	10 U	110 U	100 U
TRICHLOROETHENE	10 UJ	1 J	10 UJ	10 U	110 U	100 U
VINYL CHLORIDE	10 U	11 U	10 U	10 U	110 U	100 U
XYLENES, TOTAL	1 J	1 J	1 J	1 J	10 J	100 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U		350 U	350 U	370 U	17000 U
1,2-DICHLOROBENZENE	340 U		350 U	350 U	370 U	17000 U
1,3-DICHLOROBENZENE	340 U		350 U	350 U	370 U	17000 U
1,4-DICHLOROBENZENE	340 U		350 U	350 U	370 U	17000 U
2,4,5-TRICHLOROPHENOL	850 U		870 U	870 U	930 U	43000 U
2,4,6-TRICHLOROPHENOL	340 U		350 U	350 U	370 U	17000 U
2,4-DICHLOROPHENOL	340 U		350 U	350 U	370 U	17000 U
2,4-DIMETHYLPHENOL	340 U		350 U	350 U	370 U	17000 U
2,4-DINITROPHENOL	850 U		870 U	870 U	930 U	43000 U
2,4-DINITROTOLUENE	340 U		350 U	350 U	370 U	17000 U
2,6-DINITROTOLUENE	340 U		350 U	350 U	370 U	17000 U
2-CHLORONAPHTHALENE	340 U		350 U	350 U	370 U	17000 U
2-CHLOROPHENOL	340 U		350 U	350 U	370 U	17000 U
2-METHYLNAPHTHALENE	340 U		350 U	350 U	370 U	17000 U
2-METHYLPHENOL	340 U		350 U	350 U	370 U	17000 U
2-NITROANILINE	850 U		870 U	870 U	930 U	43000 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U		350 U	350 U	370 U	17000 U
3,3'-DICHLOROBENZIDINE	340 UJ		350 U	350 U	370 U	17000 U
3-NITROANILINE	850 U		870 U	870 U	930 U	43000 U
4,6-DINITRO-2-METHYLPHENOL	850 U		870 U	870 U	930 U	43000 U
4-BROMOPHENYL PHENYL ETHER	340 U		350 U	350 U	370 U	17000 U
4-CHLORO-3-METHYLPHENOL	340 U		350 U	350 U	370 U	17000 U
4-CHLOROANILINE	340 U		350 U	350 U	370 U	17000 U
4-CHLOROPHENYL PHENYL ETHER	340 U		350 U	350 U	370 U	17000 U
4-METHYLPHENOL	340 U		350 U	350 U	370 U	17000 U
4-NITROANILINE	850 UJ		870 U	870 U	930 U	43000 U
4-NITROPHENOL	850 U		870 U	870 U	930 U	43000 U
ACENAPHTHENE	340 U		350 U	350 U	370 U	17000 U
ACENAPHTHYLENE	340 U		350 U	350 U	370 U	17000 U
ANTHRACENE	340 U		350 U	350 U	370 U	17000 U
BENZO(A)ANTHRACENE	340 U		350 U	350 U	370 U	17000 U
BENZO(A)PYRENE	340 U		350 U	350 U	370 U	17000 U
BENZO(B)FLUORANTHENE	340 U		350 U	350 U	370 U	17000 U
BENZO(G,H,I)PERYLENE	340 U		350 U	350 U	370 U	17000 U
BENZO(K)FLUORANTHENE	340 U		350 U	350 U	370 U	17000 U
BIS(2-CHLOROETHOXY)METHANE	340 U		350 U	350 U	370 U	17000 U
BIS(2-CHLOROETHYL)ETHER	340 U		350 U	350 U	370 U	17000 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U		350 U	350 U	370 U	17000 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U		350 U	350 U	370 U	17000 U
BUTYLBENZYL PHTHALATE	340 U		350 U	350 U	370 U	17000 U
CARBAZOLE	340 U		350 UJ	350 U	370 U	17000 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	340 U		350 U	350 U	370 U	17000 U
DI-N-BUTYL PHTHALATE	340 U		350 U	350 U	370 U	17000 U
DI-N-OCTYL PHTHALATE	340 U		350 U	350 U	370 U	17000 U
DIBENZO(A,H)ANTHRACENE	340 U		350 U	350 U	370 U	17000 U
DIBENZOFURAN	340 U		350 U	350 U	370 U	17000 U
DIETHYL PHTHALATE	340 U		350 U	350 U	370 U	17000 U
DIMETHYL PHTHALATE	340 U		350 U	350 U	370 U	17000 U
FLUORANTHENE	340 U		350 U	350 U	370 U	17000 U
FLUORENE	340 U		350 U	350 U	370 U	17000 U
HEXACHLOROBENZENE	340 U		350 U	350 U	370 U	17000 U
HEXACHLOROBUTADIENE	340 U		350 U	350 U	370 U	17000 U
HEXACHLOROCYCLOPENTADIENE	340 U		350 U	350 U	370 U	17000 U
HEXACHLOROETHANE	340 U		350 U	350 U	370 U	17000 U
INDENO(1,2,3-CD)PYRENE	340 U		350 U	350 U	370 U	17000 U
ISOPHORONE	340 U		350 U	350 U	370 U	17000 U
N-NITROSO-DI-N-PROPYLAMINE	340 U		350 U	350 U	370 U	17000 U
N-NITROSODIPHENYLAMINE	340 U		350 U	350 U	370 U	17000 U
NAPHTHALENE	340 U		350 U	350 U	370 U	17000 U
NITROBENZENE	340 U		350 U	350 U	370 U	17000 U
PENTACHLOROPHENOL	850 U		870 U	870 U	930 U	43000 U
PHENANTHRENE	340 U		350 U	350 U	370 U	17000 U
PHENOL	340 U		350 U	350 U	370 U	17000 U
PYRENE	340 U		350 U	350 U	370 U	17000 U
PYRIDINE	340 UJ		350 U	350 UJ	370 U	17000 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U		34 U	34 U	37 U	34 U
AROCLOR-1221	67 U		69 U	69 U	73 U	68 U
AROCLOR-1232	34 U		34 U	34 U	37 U	34 U
AROCLOR-1242	34 U		34 U	34 U	37 U	34 U
AROCLOR-1248	34 U		34 U	34 U	37 U	34 U
AROCLOR-1254	34 U		34 U	34 U	37 U	34 U
AROCLOR-1260	34 U		34 U	34 U	37 U	34 U

METALS (mg/kg)

ALUMINUM	1870		2100	3510 J	3380 J	2460
ANTIMONY	3.2 U		3.3 UJ	3.1 UJ	2.9 UJ	2.5 UJ
ARSENIC	1.3		0.44	0.79	2.5	0.43 U
BARIUM	6.8		8.7 J	11 J	28.3 J	10
BERYLLIUM	0.12		0.16 U	0.15	0.2	0.13
CADMIUM	0.34 U		0.35 U	0.33 U	0.38	0.32 U
CALCIUM	25600 J		6330 J	46500 J	23300 J	3470
CHROMIUM	8.6 J		6 J	10.6	18.4 J	5.2 J
COBALT	6.5		2.5 U	5.8 J	5.2	2.6
COPPER	4.7		3.5	5.5 J	7.2	4.8
CYANIDE	0.25 U		0.26 U	0.26 U	0.28 U	0.26 U
HEXAVALENT CHROMIUM	2 U				2 U	2 U
IRON	4200 J		6240 J	7710 J	7470 J	5080 J
LEAD	2.6 J		1.9 J	1.3 U	3.9 J	1.5 J
MAGNESIUM	8210 J		1790 J	20000 J	6470 J	1660 J
MANGANESE	101 J		65.1 J	364 J	396 J	58.9 J
MERCURY	0.04 U		0.04 U	0.04 U	0.05 U	0.04 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-036-03	003-SB-037-02	003-SB-037-03	003-SB-038-03	003-SB-039-03	003-SB-046-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/12/97	08/06/97	08/06/97	07/23/97	09/25/97	09/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC36	AOC37	AOC37	AOC38	AOC39	AOC46
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	16.9		5.6 J	11.3	11.9	6.7
POTASSIUM	220 J		266 J	305 J	310	301
SELENIUM	0.19 U		0.89 UR	0.18 UJ	0.21 U	0.14 UJ
SILVER	0.5 U		0.52 U	0.49 U	0.55 U	0.48 U
SODIUM	64.1 U		109 J	137 J	127 J	473 J
THALLIUM	0.17 U		0.18 U	0.27 U	0.21 U	0.14 UJ
VANADIUM	10.1		18.8	14 J	15.7 J	11.3
ZINC	13.4 J		11.1 J	15.8 J	19.1 J	10.7 J

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON						2100 J
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	100 U	2 J	11 U	110 U	10 U
1,1,2,2-TETRACHLOROETHANE	100 U	100 U	12 U	11 U	110 U	10 U
1,1,2-TRICHLOROETHANE	100 U	100 U	12 U	11 U	110 U	10 U
1,1-DICHLOROETHANE	100 U	100 U	1 J	11 U	110 U	10 U
1,1-DICHLOROETHENE	100 U	100 U	12 U	11 U	110 U	10 U
1,2-DICHLOROETHANE	100 U	100 U	12 U	11 U	110 U	10 U
1,2-DICHLOROETHENE (TOTAL)	100 U	100 U	12 U	11 U	110 U	10 U
1,2-DICHLOROPROPANE	100 U	100 U	12 U	11 U	110 U	10 U
2-BUTANONE	100 U	100 U	4 J	11 U	110 U	9 J
2-HEXANONE	100 U	100 U	1 J	11 U	110 U	10 U
4-METHYL-2-PENTANONE	100 U	34 J	2 J	11 U	110 U	11
ACETONE	400	37 J	26 U	12	110 U	28
BENZENE	100 U	100 U	12 U	11 U	110 U	10 U
BROMODICHLOROMETHANE	100 U	100 U	12 U	11 U	110 U	10 U
BROMOFORM	100 U	100 U	12 U	11 U	110 U	10 U
BROMOMETHANE	100 U	100 U	12 U	11 U	110 U	10 U
CARBON DISULFIDE	100 U	100 U	14	11 U	110 U	10 U
CARBON TETRACHLORIDE	100 U	100 U	12 U	11 U	110 U	10 U
CHLOROBENZENE	100 U	100 U	12 U	11 U	110 U	10 U
CHLOROETHANE	100 U	100 U	12 U	11 U	110 U	10 U
CHLOROFORM	100 U	100 U	12 U	11 U	110 U	10 U
CHLOROMETHANE	100 U	100 U	12 U	11 U	110 U	10 U
CIS-1,3-DICHLOROPROPENE	100 U	100 U	12 U	11 U	110 U	10 U
DIBROMOCHLOROMETHANE	100 U	100 U	12 U	11 U	110 U	10 U
ETHYLBENZENE	100 U	100 U	12 U	11 U	110 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	100 U	100 U	13 U	11 U	190 U	11 U
STYRENE	100 U	100 U	12 U	11 U	110 U	10 U
TETRACHLOROETHENE	100 U	100 U	12 U	11 U	110 U	10 U
TOLUENE	100 U	100 U	2 J	1 J	110 U	10 U
TRANS-1,3-DICHLOROPROPENE	100 U	100 U	12 U	11 U	110 U	10 U
TRICHLOROETHENE	100 U	100 U	2 J	11 U	110 U	3 J
VINYL CHLORIDE	100 U	100 U	12 U	11 U	110 U	10 U
XYLENES, TOTAL	100 U	100 U	1 J	11 U	110 U	1 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
1,2-DICHLOROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
1,3-DICHLOROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
1,4-DICHLOROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
2,4,5-TRICHLOROPHENOL	870 U	860 U	1000 UJ	950 U	890 U	
2,4,6-TRICHLOROPHENOL	350 U	340 U	400 UJ	380 U	350 U	
2,4-DICHLOROPHENOL	350 U	340 U	400 UJ	380 U	350 U	
2,4-DIMETHYLPHENOL	350 U	340 U	400 UJ	380 U	350 U	
2,4-DINITROPHENOL	870 U	860 U	1000 UJ	950 U	890 U	
2,4-DINITROTOLUENE	350 U	340 U	400 UJ	380 U	350 U	
2,6-DINITROTOLUENE	350 U	340 U	400 UJ	380 U	350 U	
2-CHLORONAPHTHALENE	350 U	340 U	400 UJ	380 U	350 U	
2-CHLOROPHENOL	350 U	340 U	400 UJ	380 U	350 U	
2-METHYLNAPHTHALENE	350 U	340 U	31 J	380 U	350 U	
2-METHYLPHENOL	350 U	340 U	400 UJ	380 U	350 U	
2-NITROANILINE	870 U	860 U	1000 UJ	950 U	890 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	350 U	340 U	400 UJ	380 U	350 U	
3,3'-DICHLOROBENZIDINE	350 U	340 U	400 UJ	380 U	350 U	
3-NITROANILINE	870 U	860 U	1000 UJ	950 U	890 U	
4,6-DINITRO-2-METHYLPHENOL	870 U	860 U	1000 UJ	950 U	890 U	
4-BROMOPHENYL PHENYL ETHER	350 U	340 U	400 UJ	380 U	350 U	
4-CHLORO-3-METHYLPHENOL	350 U	340 U	400 UJ	380 U	350 U	
4-CHLOROANILINE	350 U	340 U	400 UJ	380 U	350 U	
4-CHLOROPHENYL PHENYL ETHER	350 U	340 U	400 UJ	380 U	350 U	
4-METHYLPHENOL	350 U	340 U	400 UJ	380 U	350 U	
4-NITROANILINE	870 U	860 U	1000 UJ	950 UJ	890 UJ	
4-NITROPHENOL	870 U	860 U	1000 UJ	950 U	890 U	
ACENAPHTHENE	350 U	340 U	59 J	380 U	350 U	
ACENAPHTHYLENE	350 U	340 U	20 J	380 U	350 U	
ANTHRACENE	350 U	340 U	73 J	380 U	350 U	
BENZO(A)ANTHRACENE	350 U	340 U	280 J	380 U	350 U	
BENZO(A)PYRENE	350 U	340 U	190 J	380 U	350 U	
BENZO(B)FLUORANTHENE	350 U	340 U	230 J	380 U	350 U	
BENZO(G,H,I)PERYLENE	350 U	340 U	150 J	380 U	350 U	
BENZO(K)FLUORANTHENE	350 U	340 U	190 J	380 U	350 U	
BIS(2-CHLOROETHOXY)METHANE	350 U	340 U	400 UJ	380 U	350 U	
BIS(2-CHLOROETHYL)ETHER	350 U	340 U	400 UJ	380 U	350 U	
BIS(2-CHLOROISOPROPYL) ETHER	350 U	340 U	400 UJ	380 U	350 U	
BIS(2-ETHYLHEXYL)PHTHALATE	350 U	360 U	400 UJ	44 J	26 J	
BUTYLBENZYL PHTHALATE	350 U	340 U	400 UJ	380 U	350 U	
CARBAZOLE	350 U	340 U	67 J	380 U	350 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	350 U	340 U	240 J	380 U	350 U	
DI-N-BUTYL PHTHALATE	350 U	340 U	15 J	380 U	350 U	
DI-N-OCTYL PHTHALATE	350 U	340 U	400 UJ	380 U	350 U	
DIBENZO(A,H)ANTHRACENE	350 U	340 U	50 J	380 U	350 U	
DIBENZOFURAN	350 U	340 U	41 J	380 U	350 U	
DIETHYL PHTHALATE	350 U	340 U	400 UJ	380 U	350 U	
DIMETHYL PHTHALATE	350 U	340 U	400 UJ	380 U	350 U	
FLUORANTHENE	350 U	340 U	840 J	380 U	350 U	
FLUORENE	350 U	340 U	44 J	380 U	350 U	
HEXACHLOROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
HEXACHLOROBUTADIENE	350 U	340 U	400 UJ	380 U	350 U	
HEXACHLOROCYCLOPENTADIENE	350 U	340 U	400 UJ	380 U	350 U	
HEXACHLOROETHANE	350 U	340 U	400 UJ	380 U	350 U	
INDENO(1,2,3-CD)PYRENE	350 U	340 U	120 J	380 U	350 U	
ISOPHORONE	350 U	340 U	400 UJ	380 U	350 U	
N-NITROSO-DI-N-PROPYLAMINE	350 U	340 U	400 UJ	380 U	350 U	
N-NITROSODIPHENYLAMINE	350 U	340 U	400 UJ	380 U	350 U	
NAPHTHALENE	350 U	340 U	56 J	380 U	350 U	
NITROBENZENE	350 U	340 U	400 UJ	380 U	350 U	
PENTACHLOROPHENOL	870 U	860 U	50 J	950 U	890 U	
PHENANTHRENE	350 U	340 U	570 J	380 U	350 U	
PHENOL	350 U	340 U	400 UJ	380 U	350 U	
PYRENE	350 U	340 U	590 J	380 U	350 U	
PYRIDINE	350 U	340 U	400 UJ	380 UJ	350 UJ	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U	34 U	40 UJ	38 U	35 U	
AROCLOR-1221	69 U	68 U	80 UJ	75 U	70 U	
AROCLOR-1232	34 U	34 U	40 UJ	38 U	35 U	
AROCLOR-1242	34 U	34 U	40 UJ	38 U	35 U	
AROCLOR-1248	34 U	34 U	40 UJ	38 U	35 U	
AROCLOR-1254	34 U	34 U	40 UJ	38 U	35 U	
AROCLOR-1260	34 U	34 U	40 UJ	38 U	35 U	

METALS (mg/kg)

ALUMINUM	1550	2770 J	4880	6170 J	2150 J	
ANTIMONY	2.6 UJ	3.2 UJ	3.8 UR	4 UJ	3.5 UJ	
ARSENIC	0.65 U	0.97 J	3 J	4.5	0.83	
BARIUM	16.6	11.9 J	51.8 J	56.8 J	9.6 J	
BERYLLIUM	0.05	0.1	0.3 U	0.4	0.15	
CADMIUM	0.32 U	0.4 U	0.4 U	0.42 U	0.36 U	
CALCIUM	791	3250 J	37400 J	35600 J	3380 J	
CHROMIUM	3.8 J	7.8 J	15.2	12.4	4.5	
COBALT	3.1	2.9	5.9 J	5.8 J	2.8 J	
COPPER	0.69	1.8	32.7	10.4	4.3 J	
CYANIDE	0.26 U	0.26 U	0.3 U	0.29 U	0.27 U	
HEXAVALENT CHROMIUM		2 U				
IRON	3490 J	4740 J	9170 J	12400 J	5000	
LEAD	1.6 J	2.5 J	70.2	5.7	1.4	
MAGNESIUM	950 J	2300 J	9300 J	12900 J	1580 J	
MANGANESE	182 J	52.3 J	329 J	1180 J	57.9 J	
MERCURY	0.04 U	0.04 U	0.05 U	0.26	0.3	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-047-03	003-SB-050-02	003-SB-054-02	003-SB-055-02	003-SB-055-03	003-SB-058-02
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'
SAMPLE DATE:	09/23/97	09/24/97	08/04/97	08/24/97	08/24/97	08/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC47	AOC50	AOC54	AOC55	AOC55	AOC58
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	5.5	7.1	14.1 J	12.9	6.7	
POTASSIUM	166	188	831 J	1250 J	256 J	
SELENIUM	0.14 UJ	0.2 U	0.18 UR	0.84 UJ	0.18 UJ	
SILVER	0.48 U	0.6 U	0.61 U	0.63 U	0.55 U	
SODIUM	40.3 U	92.9 J	114 J	157 J	80.4 J	
THALLIUM	0.14 U	0.2 U	0.18 UJ	0.17 U	0.18 U	
VANADIUM	5.4	10.4 J	19.3	28.7 J	14.8 J	
ZINC	8.7 U	13.5 J	49.8 J	39.4 J	10.7 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	10 U	100 U	100 U	110 U	1 J
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	100 U	100 U	110 U	11 U
1,1,2-TRICHLOROETHANE	10 U	10 U	100 U	100 U	110 U	11 U
1,1-DICHLOROETHANE	10 U	10 U	100 U	100 U	110 U	11 U
1,1-DICHLOROETHENE	10 U	10 U	100 U	100 U	110 U	11 U
1,2-DICHLOROETHANE	10 U	10 U	100 U	100 U	110 U	11 UJ
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	100 U	100 U	110 U	1 J
1,2-DICHLOROPROPANE	10 U	10 U	100 U	100 U	110 U	11 U
2-BUTANONE	10 U	3 J	100 U	100 U	110 U	5 J
2-HEXANONE	10 U	10 U	100 U	100 U	110 U	11 U
4-METHYL-2-PENTANONE	4 J	10 U	30 J	32 J	110 U	2 J
ACETONE	10 U	11 U	120	100 U	110 U	46 U
BENZENE	10 U	10 U	100 U	100 U	110 U	11 U
BROMODICHLOROMETHANE	10 U	10 U	100 U	100 U	110 U	11 U
BROMOFORM	10 U	10 U	100 U	100 U	110 U	11 U
BROMOMETHANE	10 U	2 J	100 U	100 U	110 U	11 U
CARBON DISULFIDE	10 U	10 U	100 U	100 U	110 U	11 U
CARBON TETRACHLORIDE	10 U	10 U	100 U	100 U	110 U	11 U
CHLOROBENZENE	10 U	10 U	100 U	100 U	110 U	11 U
CHLOROETHANE	10 U	10 U	100 U	100 U	110 UJ	11 UJ
CHLOROFORM	10 U	10 U	100 U	100 U	110 U	11 U
CHLOROMETHANE	10 U	10 UJ	100 U	100 U	110 U	11 UJ
CIS-1,3-DICHLOROPROPENE	10 U	10 U	100 U	100 U	110 U	11 U
DIBROMOCHLOROMETHANE	10 U	10 U	100 U	100 U	110 U	11 U
ETHYLBENZENE	10 U	10 U	100 U	100 U	110 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	10 U	100 U	100 U	110 U	11 U
STYRENE	10 U	10 U	100 U	100 U	110 U	11 U
TETRACHLOROETHENE	10 U	10 U	100 U	100 U	110 U	1 J
TOLUENE	10 U	1 J	100 U	100 U	8 U	1 J
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	100 U	100 U	110 U	11 U
TRICHLOROETHENE	4 J	10 U	100 U	100 U	110 U	8 J
VINYL CHLORIDE	10 U	10 U	100 U	100 U	110 U	11 U
XYLENES, TOTAL	10 U	10 U	100 U	100 U	110 U	1 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	350 U	350 U	340 U	350 U	360 U
1,2-DICHLOROBENZENE	340 U	350 U	350 U	340 U	350 U	360 U
1,3-DICHLOROBENZENE	340 U	350 U	350 U	340 U	350 U	360 U
1,4-DICHLOROBENZENE	340 U	350 U	350 U	340 U	350 U	360 U
2,4,5-TRICHLOROPHENOL	850 U	870 U	870 U	840 U	890 U	900 U
2,4,6-TRICHLOROPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
2,4-DICHLOROPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
2,4-DIMETHYLPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
2,4-DINITROPHENOL	850 U	870 U	870 U	840 U	890 U	900 U
2,4-DINITROTOLUENE	340 U	350 U	350 U	340 U	350 U	360 U
2,6-DINITROTOLUENE	340 U	350 U	350 U	340 U	350 U	360 U
2-CHLORONAPHTHALENE	340 U	350 U	350 U	340 U	350 U	360 U
2-CHLOROPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
2-METHYLNAPHTHALENE	340 U	350 U	350 U	340 U	350 U	360 U
2-METHYLPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
2-NITROANILINE	850 U	870 U	870 U	840 U	890 U	900 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
3,3'-DICHLOROBENZIDINE	340 U	350 U	350 U	340 U	350 U	360 U
3-NITROANILINE	850 U	870 U	870 U	840 U	890 U	900 U
4,6-DINITRO-2-METHYLPHENOL	850 U	870 U	870 U	840 U	890 U	900 U
4-BROMOPHENYL PHENYL ETHER	340 U	350 U	350 U	340 U	350 U	360 U
4-CHLORO-3-METHYLPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
4-CHLOROANILINE	340 U	350 U	350 U	340 U	350 U	360 U
4-CHLOROPHENYL PHENYL ETHER	340 U	350 U	350 U	340 U	350 U	360 U
4-METHYLPHENOL	340 U	350 U	350 U	340 U	350 U	360 U
4-NITROANILINE	850 U	870 U	870 U	840 U	890 U	900 U
4-NITROPHENOL	850 U	870 U	870 U	840 U	890 U	900 U
ACENAPHTHENE	340 U	350 U	350 U	340 U	350 U	360 U
ACENAPHTHYLENE	340 U	350 U	350 U	340 U	350 U	360 U
ANTHRACENE	340 U	350 U	350 U	340 U	350 U	360 U
BENZO(A)ANTHRACENE	340 U	350 U	350 U	340 U	350 U	360 U
BENZO(A)PYRENE	340 U	350 U	350 U	340 U	350 U	360 U
BENZO(B)FLUORANTHENE	340 U	350 U	350 U	340 U	350 U	360 U
BENZO(G,H,I)PERYLENE	340 U	350 U	350 U	340 U	350 U	360 U
BENZO(K)FLUORANTHENE	340 U	350 U	350 U	340 U	350 U	360 U
BIS(2-CHLOROETHOXY)METHANE	340 U	350 U	350 U	340 U	350 U	360 U
BIS(2-CHLOROETHYL)ETHER	340 U	350 U	350 U	340 U	350 U	360 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	350 U	350 U	340 U	350 U	360 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	350 U	350 U	340 U	350 U	360 U
BUTYLBENZYL PHTHALATE	340 U	350 U	350 U	340 U	350 U	360 U
CARBAZOLE	340 U	350 U	350 U	340 U	350 U	360 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	340 U	350 U	350 U	340 U	350 U	360 U
DI-N-BUTYL PHTHALATE	340 U	350 U	350 U	340 U	350 U	360 U
DI-N-OCTYL PHTHALATE	340 U	350 U	350 U	340 U	350 U	360 U
DIBENZO(A,H)ANTHRACENE	340 U	350 U	350 U	340 U	350 U	360 U
DIBENZOFURAN	340 U	350 U	350 U	340 U	350 U	360 U
DIETHYL PHTHALATE	340 U	350 U	350 U	340 U	350 U	360 U
DIMETHYL PHTHALATE	340 UJ	350 U	350 U	340 U	350 U	360 U
FLUORANTHENE	340 U	350 U	350 U	340 U	350 U	360 U
FLUORENE	340 U	350 U	350 U	340 U	350 U	360 U
HEXACHLOROENZENE	340 U	350 U	350 U	340 U	350 U	360 U
HEXACHLOROBUTADIENE	340 U	350 U	350 U	340 U	350 U	360 U
HEXACHLOROCYCLOPENTADIENE	340 U	350 U	350 U	340 U	350 U	360 U
HEXACHLOROETHANE	340 U	350 U	350 U	340 U	350 U	360 U
INDENO(1,2,3-CD)PYRENE	340 U	350 U	350 U	340 U	350 U	360 U
ISOPHORONE	340 U	350 U	350 U	340 U	350 U	360 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	350 U	350 U	340 U	350 U	360 U
N-NITROSODIPHENYLAMINE	340 U	350 U	350 U	340 U	350 U	360 U
NAPHTHALENE	340 U	350 U	350 U	340 U	350 U	360 U
NITROBENZENE	340 U	350 U	350 U	340 U	350 U	360 U
PENTACHLOROPHENOL	850 U	870 U	870 U	840 U	890 U	900 U
PHENANTHRENE	340 U	350 U	350 U	340 U	350 U	360 U
PHENOL	120 J	350 U	350 U	340 U	350 U	360 U
PYRENE	340 U	350 U	350 U	340 U	350 U	360 U
PYRIDINE	340 U	350 U	350 U	340 U	350 U	360 UJ

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U	34 U	34 U	33 U	35 U	35 U
AROCLOR-1221	67 U	69 U	69 U	67 U	70 U	71 U
AROCLOR-1232	34 U	34 U	34 U	33 U	35 U	35 U
AROCLOR-1242	34 U	34 U	34 U	33 U	35 U	35 U
AROCLOR-1248	34 U	34 U	34 U	33 U	35 U	35 U
AROCLOR-1254	34 U	34 U	34 U	33 U	35 U	35 U
AROCLOR-1260	34 U	34 U	34 U	33 U	35 U	35 U

METALS (mg/kg)

ALUMINUM	3000 J	2100	2400	1750 J	1960 J	2050 J
ANTIMONY	3.1 UR	3.6 UJ	2.3 UJ	2.7 UJ	2.9 UJ	3.3 UJ
ARSENIC	1.3	0.76	0.68 U	0.25	1	2.2 J
BARIUM	12 J	8.1 J	26.1	5.8 J	6.8 J	8.3 J
BERYLLIUM	0.21 U	0.19 U	0.09	0.1 U	0.09	0.12 U
CADMIUM	0.33 U	0.38 U	0.29 U	0.34 U	0.36 U	0.34 U
CALCIUM	4960 J	3350 J	965	18100 J	4360 J	22100 J
CHROMIUM	5.7 U	6 J	7.6 J	6.8	4.6	7.9
COBALT	6.1 J	3 J	3.9	4	2.9	5
COPPER	8	4.7	0.76	16.1 J	4.4	3.8 U
CYANIDE	0.26 U	0.26 U	0.26 U	0.25 U	0.27 U	0.27 U
HEXAVALENT CHROMIUM		2 U		2 U	2 U	
IRON	6370 J	6070 J	5600 J	4330 J	4920 J	6040 J
LEAD	2.5 J	1.8 J	1.6 J	1.6 J	1.4 J	1.8 J
MAGNESIUM	3330 J	1630 J	1480 J	6560 J	1620 J	8700 J
MANGANESE	145 J	58 J	185 J	86.2 J	111 J	206 J
MERCURY	0.03 U	0.04 U	0.04 U	0.04 U	0.05 U	0.05 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-058-03	003-SB-063-03	003-SB-068-03	003-SB-070-03	003-SB-071-03	003-SB-073-03
DEPTH (feet):	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	08/19/97	08/05/97	09/21/97	09/03/97	09/18/97	07/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC58	AOC63	AOC68	AOC70	AOC71	AOC73
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	10.1	5.3 J	8.3	8.9	6	8.7 J
POTASSIUM	268	218 J	246	154	181	211 J
SELENIUM	0.15 UJ	0.92 UR	0.13 UJ	0.17 UJ	0.16 UJ	0.18 UJ
SILVER	0.49 U	0.58 U	0.43 U	0.5 U	0.54 U	0.51 U
SODIUM	66.6 U	96.3 J	487 J	51.7	77.3 J	72 J
THALLIUM	0.15 UJ	0.18 U	0.13 UJ	0.17 U	0.16 UJ	0.18 U
VANADIUM	11.2 J	18	7.1	7.7	12.2	8.8 J
ZINC	18.3 J	10.6 J	11.9 J	12.3 J	10.3 J	13.1 U

MISCELLANEOUS PARAMETERS (mg/kg)

TOTAL ORGANIC CARBON		480 J	600 J	710 J		
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	110 U	120 UJ	110 U	100 U	100 U
1,1,2,2-TETRACHLOROETHANE	10 U	110 U	120 U	110 U	100 U	100 U
1,1,2-TRICHLOROETHANE	10 U	110 U	120 U	110 U	100 U	100 U
1,1-DICHLOROETHANE	10 U	110 U	120 U	110 U	100 U	100 U
1,1-DICHLOROETHENE	10 U	110 UJ	120 U	110 U	100 U	100 U
1,2-DICHLOROETHANE	10 U	110 U	120 U	110 U	100 U	100 U
1,2-DICHLOROETHENE (TOTAL)	10 U	110 U	120 U	110 U	100 U	100 U
1,2-DICHLOROPROPANE	10 U	110 U	120 U	110 U	100 U	100 U
2-BUTANONE	10 J	100 J	210 J	200	120	100
2-HEXANONE	10 U	110 U	120 U	110 U	100 U	100 U
4-METHYL-2-PENTANONE	2 J	110	64 J	110 J	96 J	40 J
ACETONE	66 U	230 J	960 J	380 U	290 U	310 U
BENZENE	10 U	110 U	120 U	110 U	100 U	100 U
BROMODICHLOROMETHANE	10 U	110 U	120 U	110 U	100 U	100 U
BROMOFORM	10 UJ	110 U	120 U	110 U	100 U	100 U
BROMOMETHANE	10 U	110 U	120 U	110 U	100 U	100 U
CARBON DISULFIDE	10 U	110 U	120 UJ	110 U	100 U	100 U
CARBON TETRACHLORIDE	10 U	110 U	120 UJ	110 U	100 U	100 U
CHLOROBENZENE	10 U	110 U	120 U	110 U	100 U	100 U
CHLOROETHANE	10 U	110 U	120 U	110 U	100 U	100 U
CHLOROFORM	10 U	110 U	120 U	110 U	100 U	100 U
CHLOROMETHANE	10 U	110 U	120 U	110 U	100 U	100 U
CIS-1,3-DICHLOROPROPENE	10 U	110 U	120 U	110 U	100 U	100 U
DIBROMOCHLOROMETHANE	10 U	110 U	120 U	110 U	100 U	100 U
ETHYLBENZENE	10 U	110 U	19 J	110 U	100 U	100 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	110 U	120 U	110 U	100 U	100 U
STYRENE	10 U	110 U	54 J	110 U	100 U	100 U
TETRACHLOROETHENE	10 UJ	110 U	120 U	110 U	100 U	100 U
TOLUENE	1 J	12 J	14 J	9 J	8 J	5 J
TRANS-1,3-DICHLOROPROPENE	10 U	110 U	120 U	110 U	100 U	100 U
TRICHLOROETHENE	10 U	110 U	120 U	110 U	100 U	100 U
VINYL CHLORIDE	10 U	110 UJ	120 U	110 U	100 U	100 U
XYLENES, TOTAL	1 J	15 J	71 J	24 J	11 J	11 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U					
1,2-DICHLOROBENZENE	340 U					
1,3-DICHLOROBENZENE	340 U					
1,4-DICHLOROBENZENE	340 U					
2,4,5-TRICHLOROPHENOL	850 U					
2,4,6-TRICHLOROPHENOL	340 U					
2,4-DICHLOROPHENOL	340 U					
2,4-DIMETHYLPHENOL	340 U					
2,4-DINITROPHENOL	850 U					
2,4-DINITROTOLUENE	340 U					
2,6-DINITROTOLUENE	340 U					
2-CHLORONAPHTHALENE	340 U					
2-CHLOROPHENOL	340 U					
2-METHYLNAPHTHALENE	340 U					
2-METHYLPHENOL	340 U					
2-NITROANILINE	850 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROPHENOL	340 U					
3,3'-DICHLOROBENZIDINE	340 UJ					
3-NITROANILINE	850 UJ					
4,6-DINITRO-2-METHYLPHENOL	850 U					
4-BROMOPHENYL PHENYL ETHER	340 U					
4-CHLORO-3-METHYLPHENOL	340 U					
4-CHLOROANILINE	340 U					
4-CHLOROPHENYL PHENYL ETHER	340 U					
4-METHYLPHENOL	340 U					
4-NITROANILINE	850 UJ					
4-NITROPHENOL	850 U					
ACENAPHTHENE	340 U					
ACENAPHTHYLENE	340 U					
ANTHRACENE	340 U					
BENZO(A)ANTHRACENE	340 U					
BENZO(A)PYRENE	340 U					
BENZO(B)FLUORANTHENE	340 U					
BENZO(G,H,I)PERYLENE	340 U					
BENZO(K)FLUORANTHENE	340 U					
BIS(2-CHLOROETHOXY)METHANE	340 U					
BIS(2-CHLOROETHYL)ETHER	340 U					
BIS(2-CHLOROISOPROPYL) ETHER	340 U					
BIS(2-ETHYLHEXYL)PHTHALATE	340 U					
BUTYLBENZYL PHTHALATE	340 U					
CARBAZOLE	340 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	340 U					
DI-N-BUTYL PHTHALATE	340 U					
DI-N-OCTYL PHTHALATE	340 U					
DIBENZO(A,H)ANTHRACENE	340 U					
DIBENZOFURAN	340 U					
DIETHYL PHTHALATE	340 U					
DIMETHYL PHTHALATE	340 U					
FLUORANTHENE	340 U					
FLUORENE	340 U					
HEXACHLOROBENZENE	340 U					
HEXACHLOROBUTADIENE	340 U					
HEXACHLOROCYCLOPENTADIENE	340 U					
HEXACHLOROETHANE	340 U					
INDENO(1,2,3-CD)PYRENE	340 U					
ISOPHORONE	340 U					
N-NITROSO-DI-N-PROPYLAMINE	340 U					
N-NITROSODIPHENYLAMINE	340 U					
NAPHTHALENE	340 U					
NITROBENZENE	340 U					
PENTACHLOROPHENOL	850 U					
PHENANTHRENE	340 U					
PHENOL	340 U					
PYRENE	340 U					
PYRIDINE	340 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U					
AROCLOR-1221	67 U					
AROCLOR-1232	34 U					
AROCLOR-1242	34 U					
AROCLOR-1248	34 U					
AROCLOR-1254	34 U					
AROCLOR-1260	34 U					

METALS (mg/kg)

ALUMINUM	2230					
ANTIMONY	2.8 UR					
ARSENIC	1 U					
BARIUM	9.3 J					
BERYLLIUM	0.13 U					
CADMIUM	0.3 U					
CALCIUM	21400 J					
CHROMIUM	12.4					
COBALT	5 J					
COPPER	3.5					
CYANIDE	0.26 U					
IRON	5390 J					
LEAD	1.4					
MAGNESIUM	6560 J					
MANGANESE	475 J					
MERCURY	0.04 U					
NICKEL	10.7 J					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-074-03	003-SB-28D-01	003-SB-29D-01	003-SB-31D-01	003-SB-31D-02	003-SB-33D-01
DEPTH (feet):	8.0 - 12.0'	5.0 - 10.0'	5.0 - 10.0'	5.0 - 10.0'	10.0 - 15.0'	5.0 - 10.0'
SAMPLE DATE:	07/27/97	12/03/97	12/05/97	11/13/97	11/13/97	11/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC74	MS-28D	MS-29D	MS-31D	MS-31D	MS-33D
FIELD DUPLICATE OF:						

METALS (mg/kg)

POTASSIUM	225 J					
SELENIUM	0.17 UR					
SILVER	0.45 U					
SODIUM	85.4 J					
THALLIUM	0.17 UJ					
VANADIUM	10.6					
ZINC	12.1 J					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	100 U	10 U	10 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	100 U	100 UJ	10 U	10 U	10 U	10 U
1,1,2-TRICHLOROETHANE	100 U	100 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	100 U	100 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	100 U	100 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	100 U	100 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	100 U	100 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	100 U	100 U	10 U	10 U	10 U	10 UJ
2-BUTANONE	42 J	100 U	10 U	10 U	10 U	5 J
2-HEXANONE	100 U	100 U	10 U	10 U	10 U	10 UJ
4-METHYL-2-PENTANONE	24 J	100 U	10 U	10 U	9 J	1 J
ACETONE	100 U	100 U	10 U	10 U	16	33 J
BENZENE	100 U	100 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	100 U	100 U	10 U	10 U	10 U	10 U
BROMOFORM	100 U	100 U	10 U	10 U	10 U	10 U
BROMOMETHANE	100 U	100 U	10 U	10 U	10 U	10 U
CARBON DISULFIDE	100 U	100 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	100 U	100 U	10 U	10 U	10 U	10 U
CHLOROENZENE	100 U	100 U	10 U	10 U	10 U	10 U
CHLOROETHANE	100 U	100 U	10 U	10 U	10 U	10 UJ
CHLOROFORM	100 U	100 U	10 U	10 U	10 U	10 U
CHLOROMETHANE	100 U	100 U	10 U	10 U	10 U	10 UJ
CIS-1,2-DICHLOROETHENE						10 U
CIS-1,3-DICHLOROPROPENE	100 U	100 U	10 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	100 U	100 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

ETHYLBENZENE	100 U	100 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	100 U	100 U	10 U	10 U	10 U	12 U
STYRENE	100 U	100 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	100 U	100 U	10 U	10 U	10 U	10 U
TOLUENE	100 U	100 U	10 U	10 U	10 U	10 U
TRANS-1,2-DICHLOROETHENE						10 U
TRANS-1,3-DICHLOROPROPENE	100 U	100 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	100 U	100 UJ	10 UJ	10 U	6 J	10 U
VINYL CHLORIDE	100 U	100 U	10 U	10 U	10 U	10 UJ
XYLENES, TOTAL	7 J	100 U	10 U	1 J	1 J	1 J

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE		340 U			340 U	340 U
1,2-DICHLOROBENZENE		340 U			340 U	340 U
1,3-DICHLOROBENZENE		340 U			340 U	340 U
1,4-DICHLOROBENZENE		340 U			340 U	340 U
2,4,5-TRICHLOROPHENOL		840 U			850 U	850 U
2,4,6-TRICHLOROPHENOL		340 U			340 U	340 U
2,4-DICHLOROPHENOL		340 U			340 U	340 U
2,4-DIMETHYLPHENOL		340 U			340 U	340 U
2,4-DINITROPHENOL		840 U			850 U	340 U
2,4-DINITROTOLUENE		340 U			340 U	340 U
2,6-DINITROTOLUENE		340 U			340 U	340 U
2-CHLORONAPHTHALENE		340 U			340 U	340 U
2-CHLOROPHENOL		340 U			340 U	340 U
2-METHYLNAPHTHALENE		340 U			340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL		340 U			340 U	340 U
2-NITROANILINE		840 U			850 U	850 U
2-NITROPHENOL		340 U			340 U	340 U
3,3'-DICHLOROBENZIDINE		340 U			340 U	340 U
3-NITROANILINE		840 U			850 U	850 U
4,6-DINITRO-2-METHYLPHENOL		840 U			850 U	850 U
4-BROMOPHENYL PHENYL ETHER		340 U			340 U	340 U
4-CHLORO-3-METHYLPHENOL		340 U			340 U	340 U
4-CHLOROANILINE		340 U			340 U	340 U
4-CHLOROPHENYL PHENYL ETHER		340 U			340 U	340 U
4-METHYLPHENOL		340 U			340 U	340 U
4-NITROANILINE		840 U			850 U	850 UJ
4-NITROPHENOL		840 U			850 U	850 UJ
ACENAPHTHENE		340 U			340 U	340 U
ACENAPHTHYLENE		340 U			340 U	340 U
ANTHRACENE		340 U			340 U	340 U
BENZO(A)ANTHRACENE		340 U			340 U	340 U
BENZO(A)PYRENE		340 U			340 U	340 U
BENZO(B)FLUORANTHENE		340 U			340 U	340 U
BENZO(G,H,I)PERYLENE		340 U			340 U	340 U
BENZO(K)FLUORANTHENE		340 U			340 U	340 U
BIS(2-CHLOROETHOXY)METHANE		340 U			340 U	340 U
BIS(2-CHLOROETHYL)ETHER		340 U			340 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER		340 U			340 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE		340 U			45 J	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE		340 U			340 U	340 U
CARBAZOLE		340 UJ			340 U	340 U
CHRYSENE		340 U			340 U	340 U
DI-N-BUTYL PHTHALATE		340 U			340 U	340 U
DI-N-OCTYL PHTHALATE		340 U			340 U	340 U
DIBENZO(A,H)ANTHRACENE		340 U			340 U	340 U
DIBENZOFURAN		340 U			340 U	340 U
DIETHYL PHTHALATE		340 U			340 U	340 U
DIMETHYL PHTHALATE		340 U			340 UJ	340 U
FLUORANTHENE		340 U			340 U	340 U
FLUORENE		340 U			340 U	340 U
HEXACHLOROBENZENE		340 U			340 U	340 U
HEXACHLOROBUTADIENE		340 U			340 U	340 U
HEXACHLOROCYCLOPENTADIENE		340 U			340 U	340 U
HEXACHLOROETHANE		340 U			340 U	340 U
INDENO(1,2,3-CD)PYRENE		340 U			340 U	340 U
ISOPHORONE		340 U			340 U	340 U
N-NITROSO-DI-N-PROPYLAMINE		340 U			340 U	340 U
N-NITROSODIPHENYLAMINE		340 U			340 U	340 U
NAPHTHALENE		340 U			340 U	340 U
NITROBENZENE		340 U			340 U	340 U
PENTACHLOROPHENOL		840 U			850 U	340 U
PHENANTHRENE		340 U			340 U	340 U
PHENOL		340 U			340 U	340 U
PYRENE		340 U			340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

PYRIDINE		340 U			340 U	340 UJ
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PCBs (µg/kg)

AROCLOR-1016		33 U			34 U	34 U
AROCLOR-1221		67 U			67 U	67 U
AROCLOR-1232		33 U			34 U	34 U
AROCLOR-1242		33 U			34 U	34 U
AROCLOR-1248		33 U			34 U	34 U
AROCLOR-1254		33 U			34 U	34 U
AROCLOR-1260		33 U			34 U	34 U

METALS (mg/kg)

ALUMINUM		2910			2060 J	2010 J
ANTIMONY		2.9 UJ			3.1 UR	2.5 UJ
ARSENIC		1.6			1.1	1.6 U
BARIUM		11.4 J			14.6 J	7.1 J
BERYLLIUM		0.15 U			0.13 U	0.07
CADMIUM		0.31 U			0.33 U	0.27 U
CALCIUM		19500 J			3470 J	19600 J
CHROMIUM		10 J			5.7 J	7.4
COBALT		5.9 J			3.4 J	5.1 J
COPPER		6.1			3.3	2.4
CYANIDE		0.25 U			0.25 U	0.25 U
IRON		6560 J			5040 J	4650 J
LEAD		2.6 J			2.5 J	1.3
MAGNESIUM		12100 J			1540 J	5620 J
MANGANESE		82.9 J			96.4 J	285 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-02	003-SB-P01-02	003-SB-P01-03-BR	003-SB-P02-02	003-SB-P02-03	003-SB-P03-03
DEPTH (feet):	10.0 - 15.0'	4.0 - 8.0'	8.0 - 12.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	11/18/97	08/07/97	08/07/97	08/18/97	08/18/97	07/12/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	P01	P01	P02	P02	P03
FIELD DUPLICATE OF:						

METALS (mg/kg)

MERCURY		0.04 U			0.04 U	0.1 U
NICKEL		10.5 J			5.4	8.4
POTASSIUM		299 J			218	205 J
SELENIUM		0.79 UR			0.16 UJ	0.18 U
SILVER		0.46 U			0.49 U	0.4 U
SODIUM		104 J			48.1 U	61.5
THALLIUM		0.16 U			0.16 U	0.18 U
VANADIUM		18.8			7.6 J	8.4
ZINC		15 J			12.1 J	10.4 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
1,1,2,2-TETRACHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
1,1,2-TRICHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
1,1-DICHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
1,1-DICHLOROETHENE	100 U	100 U	11 U	10 U	10 U	100 U
1,2-DICHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
1,2-DICHLOROETHENE (TOTAL)	100 U	100 U	11 U	10 U	10 U	100 U
1,2-DICHLOROPROPANE	100 U	100 U	11 U	10 U	10 U	100 U
2-BUTANONE	100 U	38 J	2 J	19	10 U	100 U
2-HEXANONE	100 U	100 U	11 U	10 U	10 U	100 U
4-METHYL-2-PENTANONE	43 J	43 J	11 U	8 J	10 U	18 J
ACETONE	100 U	420	14	83	11 J	65 J
BENZENE	100 U	100 U	11 U	10 U	10 U	100 U
BROMODICHLOROMETHANE	100 U	100 U	11 U	10 U	10 U	100 U
BROMOFORM	100 U	100 U	11 U	10 U	10 U	100 U
BROMOMETHANE	100 U	100 U	11 U	10 U	10 U	100 U
CARBON DISULFIDE	100 U	5 J	11 U	10 U	10 U	100 U
CARBON TETRACHLORIDE	100 U	100 U	11 U	10 U	10 U	100 U
CHLOROBENZENE	100 U	100 U	11 U	10 U	10 U	100 U
CHLOROETHANE	100 U	100 U	11 U	10 U	10 U	100 U
CHLOROFORM	100 U	100 U	11 U	10 U	10 U	100 U
CHLOROMETHANE	100 U	100 U	11 U	10 U	10 U	100 U
CIS-1,2-DICHLOROETHENE					10 U	
CIS-1,3-DICHLOROPROPENE	100 U	100 U	11 U	10 U	10 U	100 U
DIBROMOCHLOROMETHANE	100 U	100 U	11 U	10 U	10 U	100 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

ETHYLBENZENE	100 U	100 U	11 U	10 U	10 U	100 U
METHYLENE CHLORIDE	100 U	100 U	11 U	10 U	10 U	100 U
STYRENE	100 U	100 U	11 U	10 U	10 U	100 U
TETRACHLOROETHENE	100 U	100 U	11 U	10 U	10 U	100 U
TOLUENE	100 U	13 J	11 U	3 J	10 U	100 U
TRANS-1,2-DICHLOROETHENE					10 U	
TRANS-1,3-DICHLOROPROPENE	100 U	100 U	11 U	10 U	10 U	100 U
TRICHLOROETHENE	100 U	100 U	1 J	1 J	10 U	100 U
VINYL CHLORIDE	100 U	100 U	11 U	10 U	10 UJ	100 U
XYLENES, TOTAL	100 U	100 U	11 U	2 J	10 U	100 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U		340 U	340 U	340 U
1,2-DICHLOROBENZENE	340 U	340 U		340 U	340 U	340 U
1,3-DICHLOROBENZENE	340 U	340 U		340 U	340 U	340 U
1,4-DICHLOROBENZENE	340 U	340 U		340 U	340 U	340 U
2,4,5-TRICHLOROPHENOL	850 U	850 U		860 U	860 U	850 U
2,4,6-TRICHLOROPHENOL	340 U	340 U		340 U	340 U	340 U
2,4-DICHLOROPHENOL	340 U	340 U		340 U	340 U	340 U
2,4-DIMETHYLPHENOL	340 U	340 U		340 U	340 U	340 U
2,4-DINITROPHENOL	850 U	850 U		860 U	340 U	850 U
2,4-DINITROTOLUENE	340 U	340 U		340 U	340 U	340 U
2,6-DINITROTOLUENE	340 U	340 U		340 U	340 U	340 U
2-CHLORONAPHTHALENE	340 U	340 U		340 U	340 U	340 U
2-CHLOROPHENOL	340 U	340 U		340 U	340 U	340 U
2-METHYLNAPHTHALENE	340 U	340 U		340 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-METHYLPHENOL	340 U	340 U		340 U	340 U	340 U
2-NITROANILINE	850 U	850 U		860 U	860 U	850 U
2-NITROPHENOL	340 U	340 U		340 U	340 U	340 U
3,3'-DICHLOROBENZIDINE	340 U	340 UJ		340 U	340 U	340 U
3-NITROANILINE	850 U	850 U		860 U	860 U	850 U
4,6-DINITRO-2-METHYLPHENOL	850 U	850 U		860 U	860 U	850 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U		340 U	340 U	340 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U		340 U	340 U	340 U
4-CHLOROANILINE	340 U	340 U		340 U	340 U	340 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U		340 U	340 U	340 U
4-METHYLPHENOL	340 U	340 U		340 U	340 U	340 U
4-NITROANILINE	850 U	850 U		860 U	860 UJ	850 U
4-NITROPHENOL	850 U	850 U		860 U	860 UJ	850 U
ACENAPHTHENE	340 U	340 U		340 U	340 U	340 U
ACENAPHTHYLENE	340 U	340 U		340 U	340 U	340 U
ANTHRACENE	340 U	340 U		340 U	340 U	340 U
BENZO(A)ANTHRACENE	340 U	340 U		340 U	340 U	340 U
BENZO(A)PYRENE	340 U	340 U		340 U	340 U	340 U
BENZO(B)FLUORANTHENE	340 U	340 U		340 U	340 U	340 U
BENZO(G,H,I)PERYLENE	340 U	340 U		340 U	340 U	340 U
BENZO(K)FLUORANTHENE	340 U	340 U		340 U	340 U	340 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U		340 U	340 U	340 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U		340 U	340 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U		340 U	340 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	340 U	340 U		340 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

BUTYLBENZYL PHTHALATE	340 U	340 U		340 U	340 U	340 U
CARBAZOLE	340 U	340 U		340 U	340 U	340 U
CHRYSENE	340 U	340 U		340 U	340 U	340 U
DI-N-BUTYL PHTHALATE	340 U	340 U		340 U	340 U	340 U
DI-N-OCTYL PHTHALATE	340 U	340 U		340 U	340 U	340 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U		340 U	340 U	340 U
DIBENZOFURAN	340 U	340 U		340 U	340 U	340 U
DIETHYL PHTHALATE	340 U	340 U		340 U	340 U	340 U
DIMETHYL PHTHALATE	340 U	340 U		340 U	340 U	340 U
FLUORANTHENE	340 U	340 U		340 U	340 U	340 U
FLUORENE	340 U	340 U		340 U	340 U	340 U
HEXACHLORO BENZENE	340 U	340 U		340 U	340 U	340 U
HEXACHLOROBUTADIENE	340 U	340 U		340 U	340 U	340 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U		340 U	340 U	340 U
HEXACHLOROETHANE	340 U	340 U		340 U	340 U	340 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U		340 U	340 U	340 U
ISOPHORONE	340 U	340 U		340 U	340 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U		340 U	340 U	340 U
N-NITROSODIPHENYLAMINE	340 U	340 U		340 U	340 U	340 U
NAPHTHALENE	340 U	340 U		340 U	340 U	340 U
NITROBENZENE	340 U	340 U		340 U	340 U	340 U
PENTACHLOROPHENOL	850 U	850 U		860 U	340 U	850 U
PHENANTHRENE	340 U	340 U		340 U	340 U	340 U
PHENOL	340 U	340 U		340 U	340 U	340 U
PYRENE	340 U	340 U		340 U	340 U	340 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

PYRIDINE	340 U	340 U		340 U	340 UJ	340 U
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PCBs (µg/kg)

AROCLOR-1016	34 U	34 U		34 U	34 U	34 U
AROCLOR-1221	67 U	67 U		68 U	68 U	67 U
AROCLOR-1232	34 U	34 U		34 U	34 U	34 U
AROCLOR-1242	34 U	34 U		34 U	34 U	34 U
AROCLOR-1248	34 U	34 U		34 U	34 U	34 U
AROCLOR-1254	34 U	34 U		34 U	34 U	34 U
AROCLOR-1260	34 U	34 U		34 U	34 U	34 U

METALS (mg/kg)

ALUMINUM	2150 J	2290 J		2700	4780 J	2200 J
ANTIMONY	3 UJ	2.6 UJ		3.2 UJ	2.7 UJ	3.1 UJ
ARSENIC	1	1.3		1.5	1.1 U	0.77 J
BARIUM	21.6 J	5.4 J		10.6 J	19.5 J	8.7 J
BERYLLIUM	0.11 U	0.13		0.19 U	0.16	0.11 U
CADMIUM	0.37 U	0.33 U		0.34 U	0.29 U	0.38 U
CALCIUM	22400 J	1140 J		4610 J	34900 J	21700 J
CHROMIUM	8.9	6.1		8.4 J	16.8	7.9
COBALT	5.9	4.3		5.9 J	8.1 J	4.6
COPPER	3.9 U	7.5		5.3	23	4.5 U
CYANIDE	0.25 U	0.25 U		0.26 U	0.26 U	0.26 U
IRON	5670 J	4720 J		5180 J	12400 J	5750 J
LEAD	1.3 J	1.8 J		2.9 J	2.7	2 J
MAGNESIUM	7480 J	1250 J		3360 J	11800 J	7830 J
MANGANESE	873 J	46.8 J		56.9 J	195 J	254 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P04-03	003-SB-P05-02	003-SB-P06-02-BR	003-SB-P06-03	003-SB-P07-03	003-SB-P08-03
DEPTH (feet):	8.0 - 12.0'	4.0 - 8.0'	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'
SAMPLE DATE:	09/06/97	09/17/97	08/07/97	08/07/97	07/10/97	09/02/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P04	P05	P06	P06	P07	P08
FIELD DUPLICATE OF:						

METALS (mg/kg)

MERCURY	0.05 U	0.04 U		0.04 U	0.07 U	0.04 U
NICKEL	13.9	9.9		12.2 J	17.7	9.3
POTASSIUM	161	167		238 J	642 J	190
SELENIUM	0.19 U	0.18 UJ		0.85 UR	0.15 U	0.18 U
SILVER	0.56 U	0.49 U		0.51 U	0.43 U	0.57 U
SODIUM	78.4	70.9 J		74.8 J	161	86.9
THALLIUM	0.19 U	0.18 U		0.17 U	0.15 U	0.18 U
VANADIUM	7.9	14		13.5	24.1	10.3
ZINC	13.1 J	11.3 J		15 J	25.9 J	15 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	10 U	100 U	100 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	100 U	10 U	100 U	100 U	10 UJ	10 U
1,1,2-TRICHLOROETHANE	100 U	10 U	100 U	100 U	10 U	10 U
1,1-DICHLOROETHANE	100 U	10 U	100 U	100 U	10 U	10 U
1,1-DICHLOROETHENE	100 U	10 U	100 U	100 U	10 U	10 U
1,2-DICHLOROETHANE	100 U	10 U	100 U	100 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	100 U	10 U	100 U	100 U	10 U	10 U
1,2-DICHLOROPROPANE	100 U	10 U	100 U	100 U	10 U	10 U
2-BUTANONE	100 U	8 J	100 U	100 U	10 U	10 U
2-HEXANONE	100 U	10 U	100 U	100 U	10 U	10 U
4-METHYL-2-PENTANONE	69 J	8 J	36 J	84 J	10 U	10 U
ACETONE	170	56	100 U	100 U	3 J	10 U
BENZENE	100 U	10 U	100 U	100 U	10 U	10 U
BROMODICHLOROMETHANE	100 U	10 U	100 U	100 U	10 U	10 U
BROMOFORM	100 U	10 U	100 U	100 U	10 U	10 U
BROMOMETHANE	100 U	10 U	100 U	100 U	10 U	10 U
CARBON DISULFIDE	100 U	10 U	100 U	100 U	10 U	10 U
CARBON TETRACHLORIDE	100 U	10 U	100 U	100 U	10 U	10 U
CHLOROBENZENE	100 U	10 U	100 U	100 U	10 U	10 U
CHLOROETHANE	100 U	10 U	100 U	100 U	10 U	10 U
CHLOROFORM	100 U	10 U	100 U	100 U	10 U	10 U
CHLOROMETHANE	100 U	10 U	100 U	100 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	100 U	10 U	100 U	100 U	10 U	10 U
DIBROMOCHLOROMETHANE	100 U	10 U	100 U	100 U	10 U	10 U
ETHYLBENZENE	100 U	10 U	100 U	100 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	150 U	10 U	100 U	100 U	10 U	10 U
STYRENE	100 U	10 U	100 U	100 U	10 U	10 U
TETRACHLOROETHENE	100 U	10 U	100 U	100 U	10 U	10 U
TOLUENE	100 U	1 J	100 U	100 U	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	100 U	10 U	100 U	100 U	10 U	10 U
TRICHLOROETHENE	100 U	10 U	100 U	100 U	10 UJ	14
VINYL CHLORIDE	100 U	10 U	100 U	100 U	10 U	10 U
XYLENES, TOTAL	100 U	10 U	100 U	100 U	10 U	10 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
1,2-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
1,3-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
1,4-DICHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
2,2'-OXYBIS(1-CHLOROPROPANE)						330 U
2,4,5-TRICHLOROPHENOL	850 U	840 U	850 U	840 U	860 U	790 U
2,4,6-TRICHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
2,4-DICHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
2,4-DIMETHYLPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
2,4-DINITROPHENOL	850 U	840 U	850 U	840 U	340 U	790 U
2,4-DINITROTOLUENE	340 U	340 U	340 U	340 U	340 U	330 U
2,6-DINITROTOLUENE	340 U	340 U	340 U	340 U	340 U	330 U
2-CHLORONAPHTHALENE	340 U	340 U	340 U	340 U	340 U	330 U
2-CHLOROPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
2-METHYLNAPHTHALENE	340 U	340 U	340 U	340 U	340 U	330 U
2-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE	850 U	840 U	850 U	840 U	860 U	790 U
2-NITROPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
3,3'-DICHLOROBENZIDINE	340 U	340 U	340 U	340 U	340 UJ	330 U
3-NITROANILINE	850 U	840 U	850 U	840 U	860 U	790 U
4,6-DINITRO-2-METHYLPHENOL	850 U	840 U	850 U	840 U	860 U	790 U
4-BROMOPHENYL PHENYL ETHER	340 U	340 U	340 U	340 U	340 U	330 U
4-CHLORO-3-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
4-CHLOROANILINE	340 U	340 U	340 U	340 U	340 U	330 U
4-CHLOROPHENYL PHENYL ETHER	340 U	340 U	340 U	340 U	340 U	330 U
4-METHYLPHENOL	340 U	340 U	340 U	340 U	340 U	330 U
4-NITROANILINE	850 UJ	840 UJ	850 U	840 U	860 UJ	790 U
4-NITROPHENOL	850 U	840 U	850 U	840 U	860 U	790 U
ACENAPHTHENE	340 U	340 U	340 U	340 U	340 U	330 U
ACENAPHTHYLENE	340 U	340 U	340 U	340 U	340 U	330 U
ANTHRACENE	340 U	340 U	340 U	340 U	340 U	330 U
BENZO(A)ANTHRACENE	340 U	340 U	340 U	340 U	340 U	330 U
BENZO(A)PYRENE	340 U	340 U	340 U	340 U	340 U	330 U
BENZO(B)FLUORANTHENE	340 U	340 U	340 U	340 U	340 U	330 U
BENZO(G,H,I)PERYLENE	340 U	340 U	340 U	340 U	340 U	330 U
BENZO(K)FLUORANTHENE	340 U	340 U	340 U	340 U	340 U	330 U
BIS(2-CHLOROETHOXY)METHANE	340 U	340 U	340 U	340 U	340 U	330 U
BIS(2-CHLOROETHYL)ETHER	340 U	340 U	340 U	340 U	340 U	330 U
BIS(2-CHLOROISOPROPYL) ETHER	340 U	340 U	340 U	340 U	340 U	
BIS(2-ETHYLHEXYL)PHTHALATE	29 J	25 J	340 U	340 U	340 U	61
BUTYLBENZYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CARBAZOLE	340 U	340 U	340 U	340 U	340 U	330 U
CHRYSENE	340 U	340 U	340 U	340 U	340 U	330 U
DI-N-BUTYL PHTHALATE	18 J	340 U	340 U	340 U	340 U	330 U
DI-N-OCTYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	330 U
DIBENZO(A,H)ANTHRACENE	340 U	340 U	340 U	340 U	340 U	330 U
DIBENZOFURAN	340 U	340 U	340 U	340 U	340 U	330 U
DIETHYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	330 U
DIMETHYL PHTHALATE	340 U	340 U	340 U	340 U	340 U	330 U
FLUORANTHENE	340 U	340 U	340 U	340 U	340 U	330 U
FLUORENE	340 U	340 U	340 U	340 U	340 U	330 U
HEXACHLOROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
HEXACHLOROBUTADIENE	340 U	340 U	340 U	340 U	340 U	330 U
HEXACHLOROCYCLOPENTADIENE	340 U	340 U	340 U	340 U	340 U	330 U
HEXACHLOROETHANE	340 U	340 U	340 U	340 U	340 U	330 U
INDENO(1,2,3-CD)PYRENE	340 U	340 U	340 U	340 U	340 U	330 U
ISOPHORONE	340 U	340 U	340 U	340 U	340 U	330 U
N-NITROSO-DI-N-PROPYLAMINE	340 U	340 U	340 U	340 U	340 U	330 U
N-NITROSODIPHENYLAMINE	340 U	340 U	340 U	340 U	340 U	330 U
NAPHTHALENE	340 U	340 U	340 U	340 U	340 U	330 U
NITROBENZENE	340 U	340 U	340 U	340 U	340 U	330 U
PENTACHLOROPHENOL	850 U	840 U	850 U	840 U	340 U	790 U
PHENANTHRENE	340 U	340 U	340 U	340 U	340 U	330 U
PHENOL	340 U	340 U	340 U	340 U	340 U	330 U
PYRENE	340 U	340 U	340 U	340 U	340 U	330 U
PYRIDINE	340 UJ	340 UJ	340 U	340 UJ	340 UJ	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1016	34 U	33 U	34 U	33 U	34 U	33 U
AROCLOR-1221	67 U	67 U	67 U	67 U	68 U	67 U
AROCLOR-1232	34 U	33 U	34 U	33 U	34 U	33 U
AROCLOR-1242	34 U	33 U	34 U	33 U	34 U	33 U
AROCLOR-1248	34 U	33 U	34 U	33 U	34 U	33 U
AROCLOR-1254	34 U	33 U	34 U	33 U	34 U	33 U
AROCLOR-1260	34 U	33 U	34 U	33 U	34 U	33 U

METALS (mg/kg)

ALUMINUM	2650 J	2760 J	1530 J	2390 J	2550 J	2550
ANTIMONY	3.2 UJ	3.6 UJ	2.8 UJ	3.1 UJ	3.2 UJ	7.8 U
ARSENIC	2.5	6.3	0.6	0.6	3.9 J	1.4
BARIUM	12.3 J	9.6 J	6.8 J	7.7 J	12.1 J	16.4
BERYLLIUM	0.15	0.17	0.05 U	0.1 U	0.13	0.16 U
CADMIUM	0.34 U	0.38 U	0.35 U	0.38 U	0.33 U	0.47 U
CALCIUM	32400 J	35800 J	2870 J	1130 J	31800 J	5780
CHROMIUM	9.7	7.9	7	8.2	10.8 J	8.6 U
COBALT	6.8 J	11.4 J	2.4	3	10.2	4.1
COPPER	3.6	7	1.2 J	2.2 J	6.1	4.2
CYANIDE	0.25 U	0.25 U	0.25 U	0.25 UJ	0.26 U	1 U
IRON	8980 J	9550 J	3680 J	6330 J	7200 J	7200
LEAD	2.5	2.3	1.5 J	1.6	2.2 J	3.9
MAGNESIUM	12500 J	10100 J	1440 J	1440 J	10800 J	4060
MANGANESE	437 J	322 J	54.5 J	121 J	284 J	122
MERCURY	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P09-02	003-SB-P09-03	003-SB-P10-03	003-SB-P11-03	003-SB-P12-03	SB-01-0608
DEPTH (feet):	4.0 - 8.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	8.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	08/23/97	08/23/97	09/05/97	09/08/97	08/10/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P09	P09	P10	P11	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

METALS (mg/kg)

NICKEL	12.8	24.7	4.9	7	24.1	7.4 U
POTASSIUM	277 J	305 J	235	226	275 J	403
SELENIUM	0.19 UJ	0.17 UJ	0.17 U	0.19 U	0.24 U	0.62 U
SILVER	0.51 U	0.56 U	0.53 U	0.57 U	0.5 U	0.78 U
SODIUM	62.3 J	134 J	44	44.2 J	88.3 J	194
THALLIUM	0.19 U	0.17 U	0.17 U	0.25 U	0.16 UR	0.78 U
VANADIUM	12.5 J	11.6 J	5.3	9.3 J	12.7	9.2
ZINC	18.5 J	16.5 J	9.1 J	15.2 J	16.7 J	13

GENERAL CHEMISTRY

PH						9.24
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
1,1,2,2-TETRACHLOROETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
1,1,2-TRICHLOROETHANE	9	8	1500 U	11 U	12 U	10 U
1,1-DICHLOROETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
1,1-DICHLOROETHENE	11 U	11 U	1500 U	11 U	12 U	10 U
1,2-DICHLOROETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
1,2-DICHLOROETHENE (TOTAL)	11 U	11 U	1500 U	11 U	12 U	10 U
1,2-DICHLOROPROPANE	11 U	11 U	1500 U	11 U	12 U	10 U
2-BUTANONE	3	4	1500 U	11 U	12 U	4
2-HEXANONE	11 U	11 U	1500 U	11 U	12 U	10 U
4-METHYL-2-PENTANONE	11 U	11 U	1500 U	11 U	12 U	10 U
ACETONE	66 U	460	1500 U	41 U	890	10 U
BENZENE	11 U	11 U	1500 U	11 U	12 U	10 U
BROMODICHLOROMETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
BROMOFORM	11 U	11 U	1500 U	11 U	12 U	10 U
BROMOMETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
CARBON DISULFIDE	11 U	11 U	1500 U	11 U	12 U	10 U
CARBON TETRACHLORIDE	11 U	11 U	1500 U	11 U	12 U	10 U
CHLOROBENZENE	11 U	11 U	1500 U	11 U	12 U	10 U
CHLOROETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
CHLOROFORM	11 U	11 U	1500 U	11 U	12 U	10 U
CHLOROMETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
CIS-1,3-DICHLOROPROPENE	11 U	11 U	1500 U	11 U	12 U	10 U
DIBROMOCHLOROMETHANE	11 U	11 U	1500 U	11 U	12 U	10 U
ETHYLBENZENE	7	8	1500 U	11 U	12 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	11 U	11 U	1500 U	11 U	12 U	10 U
STYRENE	11 U	11 U	1500 U	11 U	12 U	10 U
TETRACHLOROETHENE	760	740	1500 U	11 U	1	10 U
TOLUENE	8	6	1500 U	11 U	2	10 U
TRANS-1,3-DICHLOROPROPENE	11 U	11 U	1500 U	11 U	12 U	10 U
TRICHLOROETHENE	770	690	1100	15	1100	4
VINYL CHLORIDE	11 U	11 U	1500 U	11 U	12 U	10 U
XYLENES, TOTAL	48	54	1500 U	11 U	12 U	10 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	700 U		370 U	380 U	380 U	330 U
1,2-DICHLOROBENZENE	700 U		370 U	380 U	380 U	330 U
1,3-DICHLOROBENZENE	700 U		370 U	380 U	380 U	330 U
1,4-DICHLOROBENZENE	700 U		370 U	380 U	380 U	330 U
2,2'-OXYBIS(1-CHLOROPROPANE)	700 U		370 U	380 U	380 U	330 U
2,4,5-TRICHLOROPHENOL	1700 U		890 U	920 U	920 U	810 U
2,4,6-TRICHLOROPHENOL	700 U		370 U	380 U	380 U	330 U
2,4-DICHLOROPHENOL	700 U		370 U	380 U	380 U	330 U
2,4-DIMETHYLPHENOL	700 U		370 U	380 U	380 U	330 U
2,4-DINITROPHENOL	1700 U		890 U	920 U		810 U
2,4-DINITROTOLUENE	700 U		370 U	380 U		330 U
2,6-DINITROTOLUENE	700 U		370 U	380 U	380 U	330 U
2-CHLORONAPHTHALENE	700 U		370 U	380 U	380 U	330 U
2-CHLOROPHENOL	700 U		370 U	380 U	380 U	330 U
2-METHYLNAPHTHALENE	87		370 U	380 U	380 U	330 U
2-METHYLPHENOL	700 U		370 U	380 U	380 U	330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE	1700 U		890 U	920 U	920 U	810 U
2-NITROPHENOL	700 U		370 U	380 U	380 U	330 U
3,3'-DICHLOROBENZIDINE	700 U		370 U	380 U		330 U
3-NITROANILINE	1700 U		890 U	920 U	920 U	810 U
4,6-DINITRO-2-METHYLPHENOL	1700 U		890 U	920 U		810 U
4-BROMOPHENYL PHENYL ETHER	700 U		370 U	380 U		330 U
4-CHLORO-3-METHYLPHENOL	700 U		370 U	380 U	380 U	330 U
4-CHLOROANILINE	700 U		370 U	380 U	380 U	330 U
4-CHLOROPHENYL PHENYL ETHER	700 U		370 U	380 U		330 U
4-METHYLPHENOL	700 U		370 U	380 U	380 U	330 U
4-NITROANILINE	1700 U		890 U	920 U		810 U
4-NITROPHENOL	1700 U		890 U	920 U		810 U
ACENAPHTHENE	700 U		370 U	380 U	380 U	330 U
ACENAPHTHYLENE	700 U		370 U	380 U	380 U	330 U
ANTHRACENE	700 U		370 U	380 U		330 U
BENZO(A)ANTHRACENE	700 U		370 U	380 U		330 U
BENZO(A)PYRENE	700 U		370 U	380 U		330 U
BENZO(B)FLUORANTHENE	700 U		370 U	380 U		330 U
BENZO(G,H,I)PERYLENE	700 U		370 U	380 U		330 U
BENZO(K)FLUORANTHENE	700 U		370 U	380 U		330 U
BIS(2-CHLOROETHOXY)METHANE	700 U		370 U	380 U	380 U	330 U
BIS(2-CHLOROETHYL)ETHER	700 U		370 U	380 U	380 U	330 U
BIS(2-ETHYLHEXYL)PHTHALATE	4400		370 U	380 U		330 U
BUTYLBENZYL PHTHALATE	700 U		370 U	380 U		330 U
CARBAZOLE	700 U		370 U	380 U		330 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	700 U		370 U	380 U		330 U
DI-N-BUTYL PHTHALATE	140		370 U	380 U		330 U
DI-N-OCTYL PHTHALATE	700 U		370 U	380 U		330 U
DIBENZO(A,H)ANTHRACENE	700 U		370 U	380 U		330 U
DIBENZOFURAN	78		370 U	380 U		330 U
DIETHYL PHTHALATE	700 U		370 U	380 U		330 U
DIMETHYL PHTHALATE	700 U		370 U	380 U	380 U	330 U
FLUORANTHENE	700 U		370 U	380 U		330 U
FLUORENE	700 U		370 U	380 U		330 U
HEXACHLOROBENZENE	700 U		370 U	380 U		330 U
HEXACHLOROBUTADIENE	700 U		370 U	380 U	380 U	330 U
HEXACHLOROCYCLOPENTADIENE	700 U		370 U	380 U	380 U	330 U
HEXACHLOROETHANE	700 U		370 U	380 U	380 U	330 U
INDENO(1,2,3-CD)PYRENE	700 U		370 U	380 U		330 U
ISOPHORONE	700 U		370 U	380 U	380 U	330 U
N-NITROSO-DI-N-PROPYLAMINE	700 U		370 U	380 U	380 U	330 U
N-NITROSODIPHENYLAMINE	700 U		370 U	380 U		330 U
NAPHTHALENE	73		370 U	380 U	380 U	330 U
NITROBENZENE	700 U		370 U	380 U	380 U	330 U
PENTACHLOROPHENOL	1700 U		890 U	920 U		810 U
PHENANTHRENE	180		370 U	380 U		330 U
PHENOL	700 U		370 U	380 U	380 U	330 U
PYRENE	100		370 U	380 U		330 U

PCBs (µg/kg)

AROCLOR-1016	170 U			38 U		
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1221	350 U			77 U		
AROCLOR-1232	170 U			38 U		
AROCLOR-1242	170 U			38 U		
AROCLOR-1248	170 U			38 U		
AROCLOR-1254	170 U			38 U		
AROCLOR-1260	170 U			38 U		

METALS (mg/kg)

ALUMINUM	2220		5210	5310	4210	2040
ANTIMONY	9.7 U		8.6 U	9.6 U	9.5 U	8.6 U
ARSENIC	0.94		2.3	2.9	2	0.94
BARIUM	36.2		27.7	29.9	25.5	6.8 U
BERYLLIUM	0.19 U		0.29	0.22	0.31	0.2
CADMIUM	3.7 U		0.52 U	0.58 U	0.57 U	0.52 U
CALCIUM	7910		25200	24300	30600	7280
CHROMIUM	618		11.4	13.2	9.8 U	4.4 U
COBALT	2.2		4.8	5.1	4.3	3.1
COPPER	54.5		9.9	10.3	10	6.4
CYANIDE	140		1.2 U	1.1 U	1.1 U	1 U
IRON	14200		11400	11400	9960	4810
LEAD	231		3.5	4	3.4	1.2
MAGNESIUM	3970		8540	9510	11500	1900
MANGANESE	103		297	302	316	71.3
MERCURY	0.04 U		0.05 U	0.05 U	0.05 U	0.05 U
NICKEL	15.3		11.8 U	13.8 U	10.4 U	6.9 U
POTASSIUM	466		862	1000	748	209

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-02-0406	SB-02-0608	SB-03-1012	SB-04-1012	SB-05-1012	SB-06-0608
DEPTH (feet):	4.0 - 6.0'	6.0 - 8.0'	10.0 - 12.0'	10.0 - 12.0'	10.0 - 12.0'	6.0 - 8.0'
SAMPLE DATE:	04/11/95	04/11/95	04/05/95	04/10/95	04/06/95	04/04/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-02	SB-02	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03
FIELD DUPLICATE OF:						

METALS (mg/kg)

SELENIUM	0.78 U		0.69 U	0.77 U	0.76 U	0.69 U
SILVER	0.97 U		0.86 U	0.96 U	0.95 U	0.86 U
SODIUM	280		175	177	162	67.2 U
THALLIUM	0.97 U		0.86 U	0.96 U	0.95 U	0.86 U
VANADIUM	7.2		25.2	24.8	20.7	9.3
ZINC	28.6		24.2	23.2	21.7	9.9

GENERAL CHEMISTRY

PH	5.63		8.38	8.32	8.64	8.62
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	53 U					
1,1,2,2-TETRACHLOROETHANE	53 U					
1,1,2-TRICHLOROETHANE	53 U					
1,1-DICHLOROETHANE	53 U					
1,1-DICHLOROETHENE	53 U					
1,2-DICHLOROETHANE	53 U					
1,2-DICHLOROETHENE (TOTAL)	53 U					
1,2-DICHLOROPROPANE	53 U					
2-BUTANONE	53 U					
2-HEXANONE	53 U					
4-METHYL-2-PENTANONE	53 U					
ACETONE	53 U					
BENZENE	53 U					
BROMODICHLOROMETHANE	53 U					
BROMOFORM	53 U					
BROMOMETHANE	53 U					
CARBON DISULFIDE	53 U					
CARBON TETRACHLORIDE	53 U					
CHLOROBENZENE	53 U					
CHLOROETHANE	53 U					
CHLOROFORM	53 U					
CHLOROMETHANE	53 U					
CIS-1,3-DICHLOROPROPENE	53 U					
DIBROMOCHLOROMETHANE	53 U					
ETHYLBENZENE	53 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	53 U					
STYRENE	53 U					
TETRACHLOROETHENE	120					
TOLUENE	53 U					
TRANS-1,3-DICHLOROPROPENE	53 U					
TRICHLOROETHENE	290					
VINYL CHLORIDE	53 U					
XYLENES, TOTAL	53 U					

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	350 U					
1,2-DICHLOROBENZENE	350 U					
1,3-DICHLOROBENZENE	350 U					
1,4-DICHLOROBENZENE	350 U					
2,2'-OXYBIS(1-CHLOROPROPANE)	350 U					
2,4,5-TRICHLOROPHENOL	850 U					
2,4,6-TRICHLOROPHENOL	350 U					
2,4-DICHLOROPHENOL	350 U					
2,4-DIMETHYLPHENOL	350 U					
2,4-DINITROPHENOL	850 U					
2,4-DINITROTOLUENE	350 U					
2,6-DINITROTOLUENE	350 U					
2-CHLORONAPHTHALENE	350 U					
2-CHLOROPHENOL	350 U					
2-METHYLNAPHTHALENE	350 U					
2-METHYLPHENOL	350 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE	850 U					
2-NITROPHENOL	350 U					
3,3'-DICHLOROBENZIDINE	350 U					
3-NITROANILINE	850 U					
4,6-DINITRO-2-METHYLPHENOL	850 U					
4-BROMOPHENYL PHENYL ETHER	350 U					
4-CHLORO-3-METHYLPHENOL	350 U					
4-CHLOROANILINE	350 U					
4-CHLOROPHENYL PHENYL ETHER	350 U					
4-METHYLPHENOL	350 U					
4-NITROANILINE	850 U					
4-NITROPHENOL	850 U					
ACENAPHTHENE	350 U					
ACENAPHTHYLENE	350 U					
ANTHRACENE	350 U					
BENZO(A)ANTHRACENE	350 U					
BENZO(A)PYRENE	350 U					
BENZO(B)FLUORANTHENE	350 U					
BENZO(G,H,I)PERYLENE	350 U					
BENZO(K)FLUORANTHENE	350 U					
BIS(2-CHLOROETHOXY)METHANE	350 U					
BIS(2-CHLOROETHYL)ETHER	350 U					
BIS(2-ETHYLHEXYL)PHTHALATE	1800					
BUTYLBENZYL PHTHALATE	350 U					
CARBAZOLE	350 U					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE	350 U					
DI-N-BUTYL PHTHALATE	87					
DI-N-OCTYL PHTHALATE	350 U					
DIBENZO(A,H)ANTHRACENE	350 U					
DIBENZOFURAN	350 U					
DIETHYL PHTHALATE	350 U					
DIMETHYL PHTHALATE	350 U					
FLUORANTHENE	350 U					
FLUORENE	350 U					
HEXACHLOROBENZENE	350 U					
HEXACHLOROBUTADIENE	350 U					
HEXACHLOROCYCLOPENTADIENE	350 U					
HEXACHLOROETHANE	350 U					
INDENO(1,2,3-CD)PYRENE	350 U					
ISOPHORONE	350 U					
N-NITROSO-DI-N-PROPYLAMINE	350 U					
N-NITROSODIPHENYLAMINE	350 U					
NAPHTHALENE	350 U					
NITROBENZENE	350 U					
PENTACHLOROPHENOL	850 U					
PHENANTHRENE	350 U					
PHENOL	350 U					
PYRENE	350 U					

PCBs (µg/kg)

AROCLOR-1016	170 U					
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1221	350 U					
AROCLOR-1232	170 U					
AROCLOR-1242	170 U					
AROCLOR-1248	170 U					
AROCLOR-1254	170 U					
AROCLOR-1260	170 U					

METALS (mg/kg)

ALUMINUM	1090					
ANTIMONY	8.4 U					
ARSENIC	0.5					
BARIUM	30.7					
BERYLLIUM	0.17 U					
CADMIUM	3.1 U					
CALCIUM	1080					
CHROMIUM	175					
COBALT	1.6					
COPPER	57.7					
CYANIDE	148					
IRON	7620					
LEAD	515					
MAGNESIUM	286					
MANGANESE	38.3					
MERCURY	0.04 U					
NICKEL	6.7 U					
POTASSIUM	210					

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - 4 TO 12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-07-0406					
DEPTH (feet):	4.0 - 6.0'					
SAMPLE DATE:	04/11/95	//	//	//	//	//
INVESTIGATION:	EAST PLATING					
LOCATION:	SB-07					
FIELD DUPLICATE OF:						

METALS (mg/kg)

SELENIUM	0.67 U					
SILVER	0.84 U					
SODIUM	262					
THALLIUM	0.84 U					
VANADIUM	4.9					
ZINC	21.8					

GENERAL CHEMISTRY

PH	5.88					
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-007-05-BR	003-SB-007-11-BR	003-SB-023-05-BR	003-SB-023-15-BR	003-SB-027-05-BR	003-SB-027-06-BR
DEPTH (feet):	16.0 - 20.0'	40.0 - 44.0'	16.0 - 20.0'	56.0 - 60.0'	16.0 - 20.0'	20.0 - 24.0'
SAMPLE DATE:	08/21/97	08/21/97	08/09/97	08/09/97	08/22/97	08/22/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC07	AOC07	AOC23	AOC23	AOC27	AOC27
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	10 U	11 U	10 U	12 U	10 U	11 U
1,1,2,2-TETRACHLOROETHANE	10 U	11 U	10 UJ	12 UJ	10 U	11 U
1,1,2-TRICHLOROETHANE	10 U	11 U	10 U	12 U	10 U	11 U
1,1-DICHLOROETHANE	10 U	11 U	10 U	1 J	10 U	11 U
1,1-DICHLOROETHENE	10 U	11 U	10 U	12 U	10 U	11 U
1,2-DICHLOROETHANE	10 U	11 U	10 U	12 U	10 U	11 U
1,2-DICHLOROETHENE (TOTAL)	10 U	11 U	10 U	7 J	10 U	11 U
1,2-DICHLOROPROPANE	10 U	11 U	10 U	12 U	10 U	11 U
2-BUTANONE	10 U	6 J	4 J	12 U	10 U	11 U
2-HEXANONE	10 U	11 U	10 UJ	12 UJ	10 U	11 U
4-METHYL-2-PENTANONE	2 J	13	10 U	12 U	10 U	11 U
ACETONE	10 UJ	28 J	20	6 J	15	12
BENZENE	10 U	11 U	10 U	12 U	10 U	11 U
BROMODICHLOROMETHANE	10 U	11 U	10 U	12 U	10 U	11 U
BROMOFORM	10 U	11 U	10 U	12 U	10 U	11 U
BROMOMETHANE	10 U	11 U	10 U	12 U	10 U	11 U
CARBON DISULFIDE	10 U	1 J	10 U	12 U	10 U	11 U
CARBON TETRACHLORIDE	10 U	11 U	10 U	12 U	10 U	11 U
CHLOROBENZENE	10 U	11 U	10 U	12 U	10 U	11 U
CHLOROETHANE	10 U	11 U	10 U	12 U	10 U	11 U
CHLOROFORM	10 U	11 U	10 U	12 U	10 U	11 U
CHLOROMETHANE	10 U	11 U	10 U	12 U	10 U	11 U
CIS-1,3-DICHLOROPROPENE	10 U	11 U	10 U	12 U	10 U	11 U
DIBROMOCHLOROMETHANE	10 U	11 U	10 U	12 U	10 U	11 U
ETHYLBENZENE	10 U	11 U	10 U	12 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-007-05-BR	003-SB-007-11-BR	003-SB-023-05-BR	003-SB-023-15-BR	003-SB-027-05-BR	003-SB-027-06-BR
DEPTH (feet):	16.0 - 20.0'	40.0 - 44.0'	16.0 - 20.0'	56.0 - 60.0'	16.0 - 20.0'	20.0 - 24.0'
SAMPLE DATE:	08/21/97	08/21/97	08/09/97	08/09/97	08/22/97	08/22/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC07	AOC07	AOC23	AOC23	AOC27	AOC27
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	10 U	11 U	10 U	13 U	10 U	11 U
STYRENE	10 U	11 U	10 U	12 U	10 U	11 U
TETRACHLOROETHENE	10 U	11 U	10 U	12 U	10 U	11 U
TOLUENE	10 U	11 U	1 J	12 U	1 J	1 J
TRANS-1,3-DICHLOROPROPENE	10 U	11 U	10 U	12 U	10 U	11 U
TRICHLOROETHENE	10 U	2 J	2 J	31 J	10 U	11 U
VINYL CHLORIDE	10 U	11 U	10 U	12 U	10 U	11 U
XYLENES, TOTAL	10 U	11 U	1 J	12 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-04-BR	003-SB-036-05-BR	003-SB-DP1-22-BR	003-SB-036-07-BR	003-SB-037-05-BR	003-SB-037-10-BR
DEPTH (feet):	12.0 - 16.0'	16.0 - 20.0'	16.0 - 20.0'	24.0 - 28.0'	16.0 - 20.0'	36.0 - 40.0'
SAMPLE DATE:	08/23/97	08/12/97	08/12/97	08/12/97	08/06/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC36	AOC36	AOC36	AOC37	AOC37
FIELD DUPLICATE OF:			003-SB-036-05-BR			

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	11 U	11 U	29 U	11 U	12 U
1,1,2,2-TETRACHLOROETHANE	100 U	11 UJ	11 UJ	29 UJ	11 U	12 U
1,1,2-TRICHLOROETHANE	100 U	11 U	11 U	29 U	11 U	12 U
1,1-DICHLOROETHANE	100 U	11 U	11 U	29 U	11 U	12 U
1,1-DICHLOROETHENE	100 U	11 U	11 U	29 U	11 U	12 U
1,2-DICHLOROETHANE	100 U	11 U	11 U	29 U	11 U	12 U
1,2-DICHLOROETHENE (TOTAL)	100 U	11 U	11 U	29 U	11 U	12 U
1,2-DICHLOROPROPANE	100 U	11 U	11 U	29 U	11 U	12 U
2-BUTANONE	100 U	1 J	11 U	3 J	4 J	19
2-HEXANONE	100 U	11 UJ	11 UJ	29 UJ	11 U	3 J
4-METHYL-2-PENTANONE	100 U	11 U	11 U	29 U	2 J	15
ACETONE	100 U	7 J	6 J	37	20	45
BENZENE	100 U	11 U	11 U	29 U	11 U	12 U
BROMODICHLOROMETHANE	100 U	11 U	11 U	29 U	11 U	12 U
BROMOFORM	100 U	11 U	11 U	29 U	11 U	12 U
BROMOMETHANE	100 U	11 U	11 U	29 U	11 U	12 U
CARBON DISULFIDE	100 U	11 U	11 U	2 J	11 U	12 U
CARBON TETRACHLORIDE	100 U	11 U	11 U	29 U	11 U	12 U
CHLOROBENZENE	100 U	11 U	11 U	29 U	11 U	12 U
CHLOROETHANE	100 U	11 U	11 U	29 U	11 U	12 U
CHLOROFORM	100 U	11 U	11 U	29 U	11 U	12 U
CHLOROMETHANE	100 U	11 U	11 U	29 U	11 UJ	12 U
CIS-1,3-DICHLOROPROPENE	100 U	11 U	11 U	29 U	11 U	12 U
DIBROMOCHLOROMETHANE	100 U	11 U	11 U	29 U	11 U	12 U
ETHYLBENZENE	100 U	11 U	11 U	29 U	11 U	12 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-030-04-BR	003-SB-036-05-BR	003-SB-DP1-22-BR	003-SB-036-07-BR	003-SB-037-05-BR	003-SB-037-10-BR
DEPTH (feet):	12.0 - 16.0'	16.0 - 20.0'	16.0 - 20.0'	24.0 - 28.0'	16.0 - 20.0'	36.0 - 40.0'
SAMPLE DATE:	08/23/97	08/12/97	08/12/97	08/12/97	08/06/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC30	AOC36	AOC36	AOC36	AOC37	AOC37
FIELD DUPLICATE OF:			003-SB-036-05-BR			

VOLATILES (µg/kg)

METHYLENE CHLORIDE	180 U	11 U	11 U	29 U	11 U	13 U
STYRENE	100 U	11 U	11 U	29 U	11 U	12 U
TETRACHLOROETHENE	100 U	11 U	11 U	29 U	11 U	12 U
TOLUENE	100 U	11 U	11 U	29 U	1 J	1 J
TRANS-1,3-DICHLOROPROPENE	100 U	11 U	11 U	29 U	11 U	12 U
TRICHLOROETHENE	100 U	11 UJ	11 UJ	29 UJ	1 J	12 UJ
VINYL CHLORIDE	100 U	11 U	11 U	29 U	11 U	12 U
XYLENES, TOTAL	100 U	11 U	11 U	2 J	1 J	1 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-055-05-BR	003-SB-058-05-BR	003-SB-DP1-25-BR	003-SB-058-15-BR	003-SB-063-04-BR	003-SB-063-14-BR
DEPTH (feet):	16.0 - 20.0'	16.0 - 20.0'	16.0 - 20.0'	56.0 - 60.0'	12.0 - 16.0'	52.0 - 56.0'
SAMPLE DATE:	08/24/97	08/19/97	08/19/97	08/21/97	08/05/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC58	AOC58	AOC63	AOC63
FIELD DUPLICATE OF:			003-SB-058-05-BR			

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	4 J	1 J	11 U	10 U	30 U
1,1,2,2-TETRACHLOROETHANE	11 U	10 U	10 U	11 U	10 U	30 U
1,1,2-TRICHLOROETHANE	11 U	10 U	10 U	11 U	10 U	30 U
1,1-DICHLOROETHANE	11 U	10 U	10 U	11 U	10 U	30 U
1,1-DICHLOROETHENE	11 U	10 U	10 U	11 U	10 U	30 U
1,2-DICHLOROETHANE	11 U	10 U	10 U	11 U	10 U	30 U
1,2-DICHLOROETHENE (TOTAL)	11 U	1 J	10 U	11 U	10 U	30 U
1,2-DICHLOROPROPANE	11 U	10 U	10 U	11 U	10 U	30 U
2-BUTANONE	11 U	10 U	10 U	11 U	10 U	30 U
2-HEXANONE	11 U	10 U	10 U	11 U	10 U	30 U
4-METHYL-2-PENTANONE	11 U	10 U	10 U	11 U	10 U	30 U
ACETONE	20	30 J	61 J	82 J	14	33
BENZENE	11 U	10 U	10 U	11 U	10 U	30 U
BROMODICHLOROMETHANE	11 U	10 U	10 U	11 U	10 U	30 U
BROMOFORM	11 U	10 U	10 U	11 U	10 U	30 U
BROMOMETHANE	11 U	10 U	10 U	11 U	10 U	30 U
CARBON DISULFIDE	11 U	10 U	10 U	11 U	10 U	6 J
CARBON TETRACHLORIDE	11 U	10 U	10 U	11 U	10 U	30 U
CHLOROBENZENE	11 U	10 U	10 U	11 U	10 U	30 U
CHLOROETHANE	11 U	10 UJ	10 UJ	11 UJ	10 U	30 U
CHLOROFORM	11 U	10 U	10 U	11 U	10 U	30 U
CHLOROMETHANE	11 U	10 U	10 U	11 U	10 UJ	30 UJ
CIS-1,3-DICHLOROPROPENE	11 U	10 U	10 U	11 U	10 U	30 U
DIBROMOCHLOROMETHANE	11 U	10 U	10 U	11 U	10 U	30 U
ETHYLBENZENE	11 U	10 U	10 U	11 U	10 U	30 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-055-05-BR	003-SB-058-05-BR	003-SB-DP1-25-BR	003-SB-058-15-BR	003-SB-063-04-BR	003-SB-063-14-BR
DEPTH (feet):	16.0 - 20.0'	16.0 - 20.0'	16.0 - 20.0'	56.0 - 60.0'	12.0 - 16.0'	52.0 - 56.0'
SAMPLE DATE:	08/24/97	08/19/97	08/19/97	08/21/97	08/05/97	08/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC58	AOC58	AOC63	AOC63
FIELD DUPLICATE OF:			003-SB-058-05-BR			

VOLATILES (µg/kg)

METHYLENE CHLORIDE	13 U	10 U	10 U	11 U	10 U	30 U
STYRENE	11 U	10 U	10 U	11 U	10 U	30 U
TETRACHLOROETHENE	11 U	10 U	10 U	11 U	10 U	30 U
TOLUENE	1 J	10 U	10 U	11 U	1 J	3 J
TRANS-1,3-DICHLOROPROPENE	11 U	10 U	10 U	11 U	10 U	30 U
TRICHLOROETHENE	11 U	6 J	3 J	11 U	10 U	30 U
VINYL CHLORIDE	11 U	10 U	10 U	11 U	10 U	30 U
XYLENES, TOTAL	11 U	10 U	1 J	11 U	10 U	30 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-28D-03	003-SB-28D-04	003-SB-28D-05	003-SB-28D-06	003-SB-28D-07	003-SB-28D-08
DEPTH (feet):	25.0 - 30.0'	35.0 - 40.0'	45.0 - 50.0'	50.0 - 55.0'	60.0 - 65.0'	70.0 - 75.0'
SAMPLE DATE:	12/03/97	12/03/97	12/03/97	12/03/97	12/03/97	12/03/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-28D	MS-28D	MS-28D	MS-28D	MS-28D	MS-28D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1,2-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1-DICHLOROETHENE	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	120 UJ
1,2-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,2-DICHLOROETHENE (TOTAL)	110 U	110 U	110 U	110 U	110 U	120 U
1,2-DICHLOROPROPANE	110 U	110 U	110 U	110 U	110 U	120 U
2-BUTANONE	110 U	140	210	130	100 J	370
2-HEXANONE	110 U	110 U	110 U	110 U	110 U	120 U
4-METHYL-2-PENTANONE	26 J	160	190	140	88 J	120 U
ACETONE	110 U	350 J	300 J	160 U	450 J	540 J
BENZENE	110 U	110 U	110 U	110 U	110 U	120 U
BROMODICHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
BROMOFORM	110 U	110 U	110 U	110 U	110 U	120 U
BROMOMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
CARBON DISULFIDE	6 J	110 U	10 J	110 U	110 U	120 U
CARBON TETRACHLORIDE	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROBENZENE	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROFORM	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	120 U
DIBROMOCHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
ETHYLBENZENE	110 U	110 U	110 U	110 U	110 U	120 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-28D-03	003-SB-28D-04	003-SB-28D-05	003-SB-28D-06	003-SB-28D-07	003-SB-28D-08
DEPTH (feet):	25.0 - 30.0'	35.0 - 40.0'	45.0 - 50.0'	50.0 - 55.0'	60.0 - 65.0'	70.0 - 75.0'
SAMPLE DATE:	12/03/97	12/03/97	12/03/97	12/03/97	12/03/97	12/03/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-28D	MS-28D	MS-28D	MS-28D	MS-28D	MS-28D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	110 U	110 U	110 U	120 U
STYRENE	110 U	110 U	110 U	110 U	110 U	120 U
TETRACHLOROETHENE	110 U	110 U	110 U	110 U	110 U	120 U
TOLUENE	8 J	17 J	13 J	14 J	17 J	23 J
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	120 U
TRICHLOROETHENE	110 U	110 U	10 J	110 U	110 U	19 J
VINYL CHLORIDE	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	120 UJ
XYLENES, TOTAL	110 U	22 J	18 J	20 J	22 J	46 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-28D-09	003-SB-28D-10	003-SB-DP2-04	003-SB-28D-11	003-SB-29D-02	003-SB-29D-03
DEPTH (feet):	80.0 - 85.0'	95.0 - 100.0'	95.0 - 100.0'	105.0 - 110.0'	15.0 - 20.0'	25.0 - 30.0'
SAMPLE DATE:	12/03/97	12/03/97	12/03/97	12/03/97	12/05/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-28D	MS-28D	MS-28D	MS-28D	MS-29D	MS-29D
FIELD DUPLICATE OF:			003-SB-28D-10			

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	120 U	120 U	110 U	110 UJ	120 UJ
1,1,2,2-TETRACHLOROETHANE	110 U	120 U	120 U	110 U	110 U	120 U
1,1,2-TRICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	120 U
1,1-DICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	120 U
1,1-DICHLOROETHENE	110 UJ	120 UJ	120 UJ	110 UJ	110 U	120 U
1,2-DICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	120 U
1,2-DICHLOROETHENE (TOTAL)	110 U	120 U	120 U	110 U	110 U	120 U
1,2-DICHLOROPROPANE	110 U	120 U	120 U	110 U	110 U	120 U
2-BUTANONE	110 J	150	71 J	280	95 J	150 J
2-HEXANONE	110 U	120 U	120 U	110 U	110 U	120 U
4-METHYL-2-PENTANONE	64 J	190	100 J	150	72 J	58 J
ACETONE	350 J	240 J	150 U	620 J	650 J	640 J
BENZENE	110 U	120 U	120 U	110 U	110 U	120 U
BROMODICHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	120 U
BROMOFORM	110 U	120 U	120 U	110 U	110 U	120 U
BROMOMETHANE	110 U	120 U	120 U	110 U	110 U	120 U
CARBON DISULFIDE	110 U	120 U	120 U	110 U	110 UJ	120 UJ
CARBON TETRACHLORIDE	110 U	120 U	120 U	110 U	110 UJ	120 UJ
CHLOROBENZENE	110 U	120 U	120 U	110 U	110 U	120 U
CHLOROETHANE	110 U	120 U	120 U	110 U	110 U	120 U
CHLOROFORM	110 U	120 U	120 U	110 U	110 U	120 U
CHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	120 U
CIS-1,3-DICHLOROPROPENE	110 U	120 U	120 U	110 U	110 U	120 U
DIBROMOCHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	120 U
ETHYLBENZENE	110 U	120 U	120 U	9 J	110 U	19 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-28D-09	003-SB-28D-10	003-SB-DP2-04	003-SB-28D-11	003-SB-29D-02	003-SB-29D-03
DEPTH (feet):	80.0 - 85.0'	95.0 - 100.0'	95.0 - 100.0'	105.0 - 110.0'	15.0 - 20.0'	25.0 - 30.0'
SAMPLE DATE:	12/03/97	12/03/97	12/03/97	12/03/97	12/05/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-28D	MS-28D	MS-28D	MS-28D	MS-29D	MS-29D
FIELD DUPLICATE OF:			003-SB-28D-10			

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	120 U	120 U	110 U	110 U	120 U
STYRENE	110 U	120 U	120 U	110 U	17 J	55 J
TETRACHLOROETHENE	110 U	120 U	120 U	110 U	110 U	120 U
TOLUENE	16 J	12 J	8 J	24 J	110 U	12 J
TRANS-1,3-DICHLOROPROPENE	110 U	120 U	120 U	110 U	110 U	120 U
TRICHLOROETHENE	12 J	120 U	120 U	110 U	110 U	120 U
VINYL CHLORIDE	110 UJ	120 UJ	120 UJ	110 UJ	110 U	120 U
XYLENES, TOTAL	22 J	19 J	29 J	53 J	22 J	80 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-29D-04	003-SB-29D-05	003-SB-29D-06	003-SB-DP2-05	003-SB-29D-07	003-SB-29D-08
DEPTH (feet):	30.0 - 35.0'	40.0 - 45.0'	55.0 - 60.0'	55.0 - 60.0'	65.0 - 70.0'	75.0 - 80.0'
SAMPLE DATE:	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D
FIELD DUPLICATE OF:				003-SB-29D-06		

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	120 UJ	120 UJ	120 UJ	110 UJ	120 UJ	110 UJ
1,1,2,2-TETRACHLOROETHANE	120 U	120 U	120 U	110 U	120 U	110 U
1,1,2-TRICHLOROETHANE	120 U	120 U	120 U	110 U	120 U	110 U
1,1-DICHLOROETHANE	120 U	120 U	120 U	110 U	120 U	110 U
1,1-DICHLOROETHENE	120 U	120 U	120 U	110 U	120 U	110 U
1,2-DICHLOROETHANE	120 U	120 U	120 U	110 U	120 U	110 U
1,2-DICHLOROETHENE (TOTAL)	120 U	120 U	120 U	110 U	120 U	110 U
1,2-DICHLOROPROPANE	120 U	120 U	120 U	110 U	120 U	110 U
2-BUTANONE	88 J	88 J	150 J	91 J	140 J	120 J
2-HEXANONE	120 U	120 U	120 U	110 U	120 U	110 U
4-METHYL-2-PENTANONE	47 J	39 J	61 J	39 J	74 J	46 J
ACETONE	380 J	380 J	670 J	450 J	620 J	360 J
BENZENE	120 U	120 U	120 UJ	110 U	120 U	110 U
BROMODICHLOROMETHANE	120 U	120 U	120 U	110 U	120 U	110 U
BROMOFORM	120 U	120 U	120 U	110 U	120 U	110 U
BROMOMETHANE	120 U	120 U	120 U	110 U	120 U	110 U
CARBON DISULFIDE	120 UJ	120 UJ	120 UJ	110 UJ	120 UJ	110 UJ
CARBON TETRACHLORIDE	120 UJ	120 UJ	120 UJ	110 UJ	120 UJ	110 UJ
CHLOROBENZENE	120 U	120 U	120 UJ	110 U	120 U	110 U
CHLOROETHANE	120 U	120 U	120 U	110 U	120 U	110 U
CHLOROFORM	120 U	120 U	120 U	110 U	120 U	110 U
CHLOROMETHANE	120 U	120 U	120 U	110 U	120 U	110 U
CIS-1,3-DICHLOROPROPENE	120 U	120 U	120 U	110 U	120 U	110 U
DIBROMOCHLOROMETHANE	120 U	120 U	120 U	110 U	120 U	110 U
ETHYLBENZENE	12 J	10 J	34 J	110 U	14 J	9 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-29D-04	003-SB-29D-05	003-SB-29D-06	003-SB-DP2-05	003-SB-29D-07	003-SB-29D-08
DEPTH (feet):	30.0 - 35.0'	40.0 - 45.0'	55.0 - 60.0'	55.0 - 60.0'	65.0 - 70.0'	75.0 - 80.0'
SAMPLE DATE:	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D
FIELD DUPLICATE OF:				003-SB-29D-06		

VOLATILES (µg/kg)

METHYLENE CHLORIDE	120 U	120 U	120 U	110 U	120 U	110 U
STYRENE	31 J	33 J	72 J	10 J	32 J	25 J
TETRACHLOROETHENE	120 U	120 U	120 U	110 U	120 U	110 U
TOLUENE	7 J	8 J	19 J	110 U	8 J	110 U
TRANS-1,3-DICHLOROPROPENE	120 U	120 U	120 U	110 U	120 U	110 U
TRICHLOROETHENE	120 U	120 U	67 J	110 U	42 J	8 J
VINYL CHLORIDE	120 U	120 U	120 U	110 U	120 U	110 U
XYLENES, TOTAL	42 J	42 J	120	20 J	58 J	35 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-29D-09	003-SB-29D-10	003-SB-29D-11	003-SB-29D-12	003-SB-29D-13	003-SB-29D-14
DEPTH (feet):	80.0 - 85.0'	95.0 - 100.0'	100.0 - 105.0'	115.0 - 120.0'	125.0 - 130.0'	130.0 - 135.0'
SAMPLE DATE:	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 UJ	120 UJ	120 UJ	110 UJ	110 UJ	110 UJ
1,1,2,2-TETRACHLOROETHANE	110 U	120 U	120 U	110 U	110 U	110 U
1,1,2-TRICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	110 U
1,1-DICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	110 U
1,1-DICHLOROETHENE	110 U	120 U	120 U	110 U	110 U	110 U
1,2-DICHLOROETHANE	110 U	120 U	120 U	110 U	110 U	110 U
1,2-DICHLOROETHENE (TOTAL)	110 U	120 U	120 U	110 U	110 U	110 U
1,2-DICHLOROPROPANE	110 U	120 U	120 U	110 U	110 U	110 U
2-BUTANONE	78 J	170 J	93 J	190 J	110 J	110 UJ
2-HEXANONE	110 U	120 U	120 U	110 U	110 U	110 U
4-METHYL-2-PENTANONE	36 J	55 J	140	81 J	48 J	41 J
ACETONE	460 J	530 J	260 U	710 J	560 J	440 J
BENZENE	110 U	120 U	120 U	110 U	110 U	110 U
BROMODICHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	110 U
BROMOFORM	110 U	120 U	120 U	110 U	110 U	110 U
BROMOMETHANE	110 U	120 U	120 U	110 U	110 U	110 U
CARBON DISULFIDE	110 UJ	7 J	11 J	110 UJ	110 UJ	110 UJ
CARBON TETRACHLORIDE	110 UJ	120 UJ	120 UJ	110 UJ	110 UJ	110 UJ
CHLOROBENZENE	110 U	120 U	120 U	110 U	110 U	110 U
CHLOROETHANE	110 U	120 U	120 U	110 U	110 U	110 U
CHLOROFORM	110 U	120 U	120 U	110 U	110 U	110 U
CHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	110 U
CIS-1,3-DICHLOROPROPENE	110 U	120 U	120 U	110 U	110 U	110 U
DIBROMOCHLOROMETHANE	110 U	120 U	120 U	110 U	110 U	110 U
ETHYLBENZENE	18 J	16 J	120 U	110 U	15 J	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-29D-09	003-SB-29D-10	003-SB-29D-11	003-SB-29D-12	003-SB-29D-13	003-SB-29D-14
DEPTH (feet):	80.0 - 85.0'	95.0 - 100.0'	100.0 - 105.0'	115.0 - 120.0'	125.0 - 130.0'	130.0 - 135.0'
SAMPLE DATE:	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97	12/06/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D	MS-29D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	120 U	120 U	110 U	110 U	110 U
STYRENE	46 J	47 J	120 U	21 J	34 J	110 U
TETRACHLOROETHENE	110 U	120 U	120 U	110 U	110 U	110 U
TOLUENE	10 J	9 J	120 U	6 J	8 J	110 U
TRANS-1,3-DICHLOROPROPENE	110 U	120 U	120 U	110 U	110 U	110 U
TRICHLOROETHENE	13 J	120 U	120 U	110 U	110 U	110 U
VINYL CHLORIDE	110 U	120 U	120 U	110 U	110 U	110 U
XYLENES, TOTAL	67 J	59 J	120 U	41 J	56 J	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-30D-02	003-SB-30D-03	003-SB-30D-04	003-SB-30D-05	003-SB-30D-06	003-SB-30D-07
DEPTH (feet):	15.0 - 20.0'	20.0 - 25.0'	35.0 - 40.0'	45.0 - 50.0'	50.0 - 55.0'	65.0 - 70.0'
SAMPLE DATE:	10/23/97	10/23/97	10/23/97	10/24/97	10/24/97	10/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-30D	MS-30D	MS-30D	MS-30D	MS-30D	MS-30D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	100 U	120 U	120 U	120 U	120 U	110 U
1,1,2,2-TETRACHLOROETHANE	100 U	120 U	120 U	120 U	120 U	110 U
1,1,2-TRICHLOROETHANE	100 U	120 U	120 U	120 U	120 U	110 U
1,1-DICHLOROETHANE	100 U	120 U	120 U	120 U	120 U	110 U
1,1-DICHLOROETHENE	100 U	120 U	120 U	120 U	120 U	110 U
1,2-DICHLOROETHANE	100 U	120 U	120 U	120 U	120 U	110 U
1,2-DICHLOROETHENE (TOTAL)	100 U	120 U	120 U	120 U	120 U	110 U
1,2-DICHLOROPROPANE	100 U	120 U	120 U	120 U	120 U	110 U
2-BUTANONE	130	180	120 U	130	150	100 J
2-HEXANONE	100 UJ	120 UJ	120 UJ	120 UJ	120 UJ	110 UJ
4-METHYL-2-PENTANONE	46 J	81 J	56 J	64 J	72 J	48 J
ACETONE	450 J	360 J	120 U	230 U	260 U	160 U
BENZENE	100 U	120 U	120 U	120 U	120 U	110 U
BROMODICHLOROMETHANE	100 U	120 U	120 U	120 U	120 U	110 U
BROMOFORM	100 U	120 U	120 U	120 U	120 U	110 U
BROMOMETHANE	100 U	120 U	120 U	120 U	120 U	110 U
CARBON DISULFIDE	100 U	120 U	120 U	120 U	120 U	110 U
CARBON TETRACHLORIDE	100 U	120 U	120 U	120 U	120 U	110 U
CHLOROENZENE	100 U	120 U	120 U	120 U	120 U	110 U
CHLOROETHANE	100 UJ	120 UJ	120 UJ	120 UJ	120 UJ	110 UJ
CHLOROFORM	100 U	120 U	120 U	120 U	120 U	110 U
CHLOROMETHANE	100 U	120 U	120 U	120 U	120 U	110 U
CIS-1,3-DICHLOROPROPENE	100 U	120 U	120 U	120 U	120 U	110 U
DIBROMOCHLOROMETHANE	100 U	120 U	120 U	120 U	120 U	110 U
ETHYLBENZENE	100 U	120 U	120 U	120 U	120 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-30D-02	003-SB-30D-03	003-SB-30D-04	003-SB-30D-05	003-SB-30D-06	003-SB-30D-07
DEPTH (feet):	15.0 - 20.0'	20.0 - 25.0'	35.0 - 40.0'	45.0 - 50.0'	50.0 - 55.0'	65.0 - 70.0'
SAMPLE DATE:	10/23/97	10/23/97	10/23/97	10/24/97	10/24/97	10/24/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-30D	MS-30D	MS-30D	MS-30D	MS-30D	MS-30D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	100 U	120 U	120 U	120 U	120 U	110 U
STYRENE	100 U	120 U	120 U	120 U	120 U	110 U
TETRACHLOROETHENE	100 U	120 U	120 U	120 U	120 U	110 U
TOLUENE	100 U	120 U	120 U	120 U	120 U	110 U
TRANS-1,3-DICHLOROPROPENE	100 U	120 U	120 U	120 U	120 U	110 U
TRICHLOROETHENE	100 U	120 U	120 U	120 U	120 U	110 U
VINYL CHLORIDE	100 U	120 U	120 U	120 U	120 U	110 U
XYLENES, TOTAL	12 J	10 J	120 U	120 U	10 J	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-30D-08	003-SB-30D-09	003-SB-30D-10	003-SB-31D-03	003-SB-31D-04	003-SB-31D-05
DEPTH (feet):	70.0 - 75.0'	80.0 - 85.0'	90.0 - 95.0'	20.0 - 25.0'	30.0 - 35.0'	40.0 - 45.0'
SAMPLE DATE:	10/24/97	10/24/97	10/24/97	11/13/97	11/13/97	11/13/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-30D	MS-30D	MS-30D	MS-31D	MS-31D	MS-31D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1,2-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,1-DICHLOROETHENE	110 U	110 U	110 U	110 U	110 U	120 U
1,2-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	120 U
1,2-DICHLOROETHENE (TOTAL)	110 U	110 U	110 U	7 J	110 U	20 J
1,2-DICHLOROPROPANE	110 U	110 U	110 U	110 U	110 U	120 U
2-BUTANONE	81 J	110 U	110	110 U	110 U	120 U
2-HEXANONE	110 UJ	110 UJ	110 UJ	110 U	110 U	120 U
4-METHYL-2-PENTANONE	56 J	40 J	120	110 U	110 U	120 U
ACETONE	140 U	110 U	160 U	200 U	380 U	150 U
BENZENE	110 U	110 U	110 U	110 U	110 U	120 U
BROMODICHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
BROMOFORM	110 U	110 U	110 U	110 U	110 U	120 U
BROMOMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
CARBON DISULFIDE	110 U	110 U	110 U	110 U	110 U	120 U
CARBON TETRACHLORIDE	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROBENZENE	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROETHANE	110 UJ	110 UJ	110 UJ	110 U	110 U	120 U
CHLOROFORM	110 U	110 U	110 U	110 U	110 U	120 U
CHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	120 U
DIBROMOCHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	120 U
ETHYLBENZENE	110 U	110 U	110 U	110 U	110 U	120 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-30D-08	003-SB-30D-09	003-SB-30D-10	003-SB-31D-03	003-SB-31D-04	003-SB-31D-05
DEPTH (feet):	70.0 - 75.0'	80.0 - 85.0'	90.0 - 95.0'	20.0 - 25.0'	30.0 - 35.0'	40.0 - 45.0'
SAMPLE DATE:	10/24/97	10/24/97	10/24/97	11/13/97	11/13/97	11/13/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-30D	MS-30D	MS-30D	MS-31D	MS-31D	MS-31D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	110 U	110 U	110 U	120 U
STYRENE	110 U	110 U	110 U	110 U	110 U	120 U
TETRACHLOROETHENE	110 U	110 U	110 U	110 U	110 U	120 U
TOLUENE	110 U	110 U	110 U	6 J	7 J	120 U
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	120 U
TRICHLOROETHENE	110 U	110 U	110 U	110 U	110 U	120 U
VINYL CHLORIDE	110 U	110 U	110 U	110 U	110 U	120 U
XYLENES, TOTAL	110 U	110 U	110 U	9 J	11 J	7 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP2-01	003-SB-31D-06	003-SB-31D-07	003-SB-31D-08	003-SB-31D-09	003-SB-DP2-02
DEPTH (feet):	40.0 - 45.0'	55.0 - 60.0'	65.0 - 70.0'	70.0 - 75.0'	80.0 - 85.0'	80.0 - 85.0'
SAMPLE DATE:	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31D	MS-31D	MS-31D	MS-31D	MS-31D
FIELD DUPLICATE OF:	003-SB-31D-05					003-SB-31D-09

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
1,1,2-TRICHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
1,1-DICHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
1,1-DICHLOROETHENE	110 U	110 U	120 U	120 U	120 U	110 U
1,2-DICHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
1,2-DICHLOROETHENE (TOTAL)	6 J	110 U	120 U	120 U	120 U	110 U
1,2-DICHLOROPROPANE	110 U	110 U	120 U	120 U	120 U	110 U
2-BUTANONE	120	81 J	66 J	69 J	120 U	58 J
2-HEXANONE	110 U	110 U	120 U	120 U	120 U	110 U
4-METHYL-2-PENTANONE	76 J	110 U	26 J	120 U	120 U	23 J
ACETONE	400 U	280 U	340 U	290 U	190 U	220 U
BENZENE	110 U	110 U	120 U	120 U	120 U	110 U
BROMODICHLOROMETHANE	110 U	110 U	120 U	120 U	120 U	110 U
BROMOFORM	110 U	110 U	120 U	120 U	120 U	110 U
BROMOMETHANE	110 U	110 U	120 U	120 U	120 U	110 U
CARBON DISULFIDE	110 U	110 U	120 U	120 U	120 U	110 U
CARBON TETRACHLORIDE	110 U	110 U	120 U	120 U	120 U	110 U
CHLOROBENZENE	110 U	110 U	120 U	120 U	120 U	110 U
CHLOROETHANE	110 U	110 U	120 U	120 U	120 U	110 U
CHLOROFORM	110 U	110 U	120 U	120 U	120 U	110 U
CHLOROMETHANE	110 U	110 U	120 U	120 U	120 U	110 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	120 U	120 U	120 U	110 U
DIBROMOCHLOROMETHANE	110 U	110 U	120 U	120 U	120 U	110 U
ETHYLBENZENE	110 U	110 U	120 U	120 U	120 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-DP2-01	003-SB-31D-06	003-SB-31D-07	003-SB-31D-08	003-SB-31D-09	003-SB-DP2-02
DEPTH (feet):	40.0 - 45.0'	55.0 - 60.0'	65.0 - 70.0'	70.0 - 75.0'	80.0 - 85.0'	80.0 - 85.0'
SAMPLE DATE:	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31D	MS-31D	MS-31D	MS-31D	MS-31D
FIELD DUPLICATE OF:	003-SB-31D-05					003-SB-31D-09

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	120 U	120 U	120 U	110 U
STYRENE	110 U	110 U	120 U	120 U	120 U	110 U
TETRACHLOROETHENE	110 U	110 U	120 U	120 U	120 U	110 U
TOLUENE	6 J	110 U	7 J	7 J	120 U	110 U
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	120 U	120 U	120 U	110 U
TRICHLOROETHENE	110 U	110 U	120 U	120 U	120 U	110 U
VINYL CHLORIDE	110 U	110 U	120 U	120 U	120 U	110 U
XYLENES, TOTAL	10 J	7 J	12 J	10 J	120 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-31D-10	003-SB-31D-11	003-SB-31D-12	003-SB-31D-13	003-SB-32D-02	003-SB-DP2-06
DEPTH (feet):	95.0 - 100.0'	105.0 - 110.0'	110.0 - 115.0'	120.0 - 125.0'	15.0 - 20.0'	15.0 - 20.0'
SAMPLE DATE:	11/14/97	11/14/97	11/14/97	11/14/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31D	MS-31D	MS-31D	MS-32D	MS-32D
FIELD DUPLICATE OF:						003-SB-32D-02

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1,2-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHENE	110 U	110 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHENE (TOTAL)	110 U	110 U	110 U	110 U	110 U	110 U
1,2-DICHLOROPROPANE	110 U	110 U	110 U	110 U	110 U	110 U
2-BUTANONE	110 U	110 U	46 J	110 U	280	200
2-HEXANONE	110 U	110 U	110 U	110 U	110 U	110 U
4-METHYL-2-PENTANONE	110 U	110 U	110 U	110 U	140	100 J
ACETONE	110 U	380 U	190 U	120 U	520 J	330
BENZENE	110 U	110 U	110 U	110 U	110 U	110 U
BROMODICHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
BROMOFORM	110 U	110 U	110 U	110 U	110 U	110 U
BROMOMETHANE	110 U	110 U	110 U	110 U	110 UJ	110 UJ
CARBON DISULFIDE	110 U	6 J	18 J	110 U	110 U	110 U
CARBON TETRACHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
CHLOROBENZENE	110 U	110 U	110 U	110 U	110 U	110 U
CHLOROETHANE	110 U	110 U	110 U	110 U	110 UJ	110 UJ
CHLOROFORM	110 U	110 U	110 U	110 U	110 U	110 U
CHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	110 U
DIBROMOCHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
ETHYLBENZENE	110 U	110 U	110 U	110 U	110 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-31D-10	003-SB-31D-11	003-SB-31D-12	003-SB-31D-13	003-SB-32D-02	003-SB-DP2-06
DEPTH (feet):	95.0 - 100.0'	105.0 - 110.0'	110.0 - 115.0'	120.0 - 125.0'	15.0 - 20.0'	15.0 - 20.0'
SAMPLE DATE:	11/14/97	11/14/97	11/14/97	11/14/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31D	MS-31D	MS-31D	MS-32D	MS-32D
FIELD DUPLICATE OF:						003-SB-32D-02

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
STYRENE	110 U	110 U	110 U	110 U	110 U	110 U
TETRACHLOROETHENE	110 U	110 U	110 U	110 U	110 U	110 U
TOLUENE	110 U	7 J	110 U	6 J	110 U	110 U
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	110 U
TRICHLOROETHENE	110 U	110 U	110 U	110 U	110 U	110 U
VINYL CHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
XYLENES, TOTAL	110 U	10 J	6 J	9 J	110 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-03	003-SB-32D-04	003-SB-32D-05	003-SB-DP2-07	003-SB-32D-06	003-SB-32D-07
DEPTH (feet):	25.0 - 30.0'	30.0 - 35.0'	45.0 - 50.0'	45.0 - 50.0'	50.0 - 55.0'	60.0 - 65.0'
SAMPLE DATE:	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D
FIELD DUPLICATE OF:				003-SB-32D-05		

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1,2,2-TETRACHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1,2-TRICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHENE	110 U	110 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHANE	110 U	110 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHENE (TOTAL)	110 U	6 J	61 J	120	40 J	110 U
1,2-DICHLOROPROPANE	110 U	110 U	110 U	110 U	110 U	110 U
2-BUTANONE	190	180	100 J	150	230	250
2-HEXANONE	110 U	110 U	110 U	110 U	110 U	110 U
4-METHYL-2-PENTANONE	210	260	130	90 J	150	150
ACETONE	430 J	460 J	310 U	410	960 J	1000 J
BENZENE	110 U	110 U	110 UJ	110 U	110 U	110 U
BROMODICHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
BROMOFORM	110 U	110 U	110 U	110 U	110 U	110 U
BROMOMETHANE	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ
CARBON DISULFIDE	110 U	110 U	110 U	110 U	110 U	6 J
CARBON TETRACHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
CHLOROBENZENE	110 U	110 U	110 UJ	110 U	110 U	110 U
CHLOROETHANE	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ
CHLOROFORM	110 U	110 U	110 U	110 U	110 U	110 U
CHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
CIS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	110 U
DIBROMOCHLOROMETHANE	110 U	110 U	110 U	110 U	110 U	110 U
ETHYLBENZENE	110 U	110 U	110 U	110 U	11 J	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-03	003-SB-32D-04	003-SB-32D-05	003-SB-DP2-07	003-SB-32D-06	003-SB-32D-07
DEPTH (feet):	25.0 - 30.0'	30.0 - 35.0'	45.0 - 50.0'	45.0 - 50.0'	50.0 - 55.0'	60.0 - 65.0'
SAMPLE DATE:	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D
FIELD DUPLICATE OF:				003-SB-32D-05		

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
STYRENE	110 U	110 U	110 U	110 U	22 J	110 U
TETRACHLOROETHENE	110 U	110 U	110 U	110 U	110 U	110 U
TOLUENE	110 U	110 U	110 UJ	110 U	9 J	110 U
TRANS-1,3-DICHLOROPROPENE	110 U	110 U	110 U	110 U	110 U	110 U
TRICHLOROETHENE	110 U	6 J	74 J	160	89 J	110 U
VINYL CHLORIDE	110 U	110 U	110 U	110 U	110 U	110 U
XYLENES, TOTAL	8 J	9 J	110 U	110 U	49 J	10 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-08	003-SB-32D-09	003-SB-32D-10	003-SB-32D-11	003-SB-32D-12	003-SB-DP2-08
DEPTH (feet):	75.0 - 80.0'	80.0 - 85.0'	90.0 - 95.0'	100.0 - 105.0'	110.0 - 115.0'	110.0 - 115.0'
SAMPLE DATE:	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D
FIELD DUPLICATE OF:						003-SB-32D-12

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	120 U	120 U	110 U	110 U	110 U	110 U
1,1,2,2-TETRACHLOROETHANE	120 U	120 U	110 U	110 U	110 U	110 U
1,1,2-TRICHLOROETHANE	120 U	120 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHANE	120 U	120 U	110 U	110 U	110 U	110 U
1,1-DICHLOROETHENE	120 U	120 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHANE	120 U	120 U	110 U	110 U	110 U	110 U
1,2-DICHLOROETHENE (TOTAL)	290	120 U	38 J	110 U	110 U	110 U
1,2-DICHLOROPROPANE	120 U	120 U	110 U	110 U	110 U	110 U
2-BUTANONE	260	250	110 U	190	150	190
2-HEXANONE	120 U	120 U	110 U	110 U	110 U	110 U
4-METHYL-2-PENTANONE	140	120	110 U	87 J	170	83 J
ACETONE	630 J	320 U	110 U	550	360	200
BENZENE	120 U	120 U	110 U	110 U	110 U	110 UJ
BROMODICHLOROMETHANE	120 U	120 U	110 U	110 U	110 U	110 U
BROMOFORM	120 U	120 U	110 U	110 U	110 U	110 U
BROMOMETHANE	120 UJ	120 UJ	110 UJ	110 UJ	110 UJ	110 UJ
CARBON DISULFIDE	120 U	120 U	110 U	110 U	110 U	110 U
CARBON TETRACHLORIDE	120 U	120 U	110 U	110 U	110 U	110 U
CHLOROBENZENE	120 U	120 U	110 U	110 U	110 U	110 UJ
CHLOROETHANE	120 UJ	120 UJ	110 UJ	110 UJ	110 UJ	110 UJ
CHLOROFORM	120 U	120 U	110 U	110 U	110 U	110 U
CHLOROMETHANE	120 U	120 U	110 U	110 U	110 U	110 U
CIS-1,3-DICHLOROPROPENE	120 U	120 U	110 U	110 U	110 U	110 U
DIBROMOCHLOROMETHANE	120 U	120 U	110 U	110 U	110 U	110 U
ETHYLBENZENE	120 U	120 U	110 U	110 U	110 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-08	003-SB-32D-09	003-SB-32D-10	003-SB-32D-11	003-SB-32D-12	003-SB-DP2-08
DEPTH (feet):	75.0 - 80.0'	80.0 - 85.0'	90.0 - 95.0'	100.0 - 105.0'	110.0 - 115.0'	110.0 - 115.0'
SAMPLE DATE:	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97	12/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D	MS-32D
FIELD DUPLICATE OF:						003-SB-32D-12

VOLATILES (µg/kg)

METHYLENE CHLORIDE	120 U	120 U	110 U	110 U	110 U	110 U
STYRENE	120 U	120 U	110 U	110 U	110 U	110 U
TETRACHLOROETHENE	120 U	120 U	110 U	110 U	110 U	110 U
TOLUENE	120 U	120 U	110 U	110 U	110 U	110 U
TRANS-1,3-DICHLOROPROPENE	120 U	120 U	110 U	110 U	110 U	110 U
TRICHLOROETHENE	2000	190	400	27 J	10 J	21 J
VINYL CHLORIDE	120 U	120 U	110 U	110 U	110 U	110 U
XYLENES, TOTAL	8 J	120 U	110 U	110 U	110 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-13	003-SB-33D-03	003-SB-33D-04	003-SB-33D-05	003-SB-33D-06	003-SB-DP2-03
DEPTH (feet):	120.0 - 125.0'	20.0 - 25.0'	30.0 - 35.0'	45.0 - 50.0'	55.0 - 60.0'	55.0 - 60.0'
SAMPLE DATE:	12/08/97	11/18/97	11/18/97	11/18/97	11/19/97	11/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D
FIELD DUPLICATE OF:						003-SB-33D-06

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	120 U	110 U	120 U	120 U	110 U	120 U
1,1,2,2-TETRACHLOROETHANE	120 U	110 U	120 U	120 U	110 U	120 U
1,1,2-TRICHLOROETHANE	120 U	110 U	120 U	120 U	110 U	120 U
1,1-DICHLOROETHANE	120 U	110 U	120 U	120 U	110 U	120 U
1,1-DICHLOROETHENE	120 U	110 U	120 U	120 U	110 U	120 U
1,2-DICHLOROETHANE	120 U	110 U	120 U	120 U	110 U	120 U
1,2-DICHLOROETHENE (TOTAL)	120 U	110 U	15 J	120 U	110 U	34 J
1,2-DICHLOROPROPANE	120 U	110 U	120 U	120 U	110 U	120 U
2-BUTANONE	140	84 J	86 J	120	110 U	120 U
2-HEXANONE	120 U	110 U	120 U	120 U	110 U	120 U
4-METHYL-2-PENTANONE	150	42 J	120 U	47 J	110 U	74 J
ACETONE	310	200 U	420 U	390 U	530 U	220 U
BENZENE	120 U	110 U	120 U	120 U	110 U	120 U
BROMODICHLOROMETHANE	120 U	110 U	120 U	120 U	110 U	120 U
BROMOFORM	120 U	110 U	120 U	120 U	110 U	120 U
BROMOMETHANE	120 UJ	110 U	120 U	120 U	110 U	120 U
CARBON DISULFIDE	120 U	110 U	120 U	120 U	110 U	120 U
CARBON TETRACHLORIDE	120 U	110 U	120 U	120 U	110 U	120 U
CHLOROBENZENE	120 U	110 U	120 U	120 U	110 U	120 U
CHLOROETHANE	120 UJ	110 U	120 U	120 U	110 U	120 U
CHLOROFORM	120 U	110 U	120 U	120 U	110 U	120 U
CHLOROMETHANE	120 U	110 U	120 U	120 U	110 U	120 U
CIS-1,3-DICHLOROPROPENE	120 U	110 U	120 U	120 U	110 U	120 U
DIBROMOCHLOROMETHANE	120 U	110 U	120 U	120 U	110 U	120 U
ETHYLBENZENE	120 U	110 U	120 U	120 U	110 U	120 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-32D-13	003-SB-33D-03	003-SB-33D-04	003-SB-33D-05	003-SB-33D-06	003-SB-DP2-03
DEPTH (feet):	120.0 - 125.0'	20.0 - 25.0'	30.0 - 35.0'	45.0 - 50.0'	55.0 - 60.0'	55.0 - 60.0'
SAMPLE DATE:	12/08/97	11/18/97	11/18/97	11/18/97	11/19/97	11/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32D	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D
FIELD DUPLICATE OF:						003-SB-33D-06

VOLATILES (µg/kg)

METHYLENE CHLORIDE	110 U	110 U	120 U	120 U	110 U	120 U
STYRENE	120 U	110 U	120 U	120 U	110 U	120 U
TETRACHLOROETHENE	120 U	110 U	120 U	120 U	110 U	120 U
TOLUENE	120 U	110 U	10 J	7 J	10 J	120 U
TRANS-1,3-DICHLOROPROPENE	120 U	110 U	120 U	120 U	110 U	120 U
TRICHLOROETHENE	120 U	110 U	66 J	190	510	1400
VINYL CHLORIDE	120 U	110 U	120 U	120 U	110 U	120 U
XYLENES, TOTAL	120 U	8 J	17 J	14 J	17 J	8 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-07	003-SB-33D-08	003-SB-33D-09	003-SB-33D-10	003-SB-33D-11	003-SB-33D-12
DEPTH (feet):	65.0 - 70.0'	70.0 - 75.0'	80.0 - 85.0'	90.0 - 95.0'	105.0 - 110.0'	110.0 - 115.0'
SAMPLE DATE:	11/19/97	11/19/97	11/19/97	11/19/97	11/19/97	11/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
1,1,2,2-TETRACHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
1,1,2-TRICHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
1,1-DICHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
1,1-DICHLOROETHENE	120 U	120 U	110 U	120 U	110 U	110 U
1,2-DICHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
1,2-DICHLOROETHENE (TOTAL)	98 J	15 J	110 U	120 U	110 U	110 U
1,2-DICHLOROPROPANE	120 U	120 U	110 U	120 U	110 U	110 U
2-BUTANONE	42 J	110 J	31 J	120 U	120	110 U
2-HEXANONE	120 U	120 U	110 U	120 U	16 J	110 U
4-METHYL-2-PENTANONE	32 J	120 U	39 J	47 J	47 J	110 U
ACETONE	180 U	260 U	140 U	230 U	270 U	110 U
BENZENE	120 U	120 U	110 U	120 U	110 U	110 U
BROMODICHLOROMETHANE	120 U	120 U	110 U	120 U	110 U	110 U
BROMOFORM	120 U	120 U	110 U	120 U	110 U	110 U
BROMOMETHANE	120 U	120 U	110 U	120 U	110 U	110 U
CARBON DISULFIDE	120 U	120 U	110 U	120 U	110 U	110 U
CARBON TETRACHLORIDE	120 U	120 U	110 U	120 U	110 U	110 U
CHLOROBENZENE	120 U	120 U	110 U	120 U	110 U	110 U
CHLOROETHANE	120 U	120 U	110 U	120 U	110 U	110 U
CHLOROFORM	120 U	120 U	110 U	120 U	110 U	110 U
CHLOROMETHANE	120 U	120 U	110 U	120 U	110 U	110 U
CIS-1,3-DICHLOROPROPENE	120 U	120 U	110 U	120 U	110 U	110 U
DIBROMOCHLOROMETHANE	120 U	120 U	110 U	120 U	110 U	110 U
ETHYLBENZENE	120 U	120 U	110 U	120 U	110 U	110 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-33D-07	003-SB-33D-08	003-SB-33D-09	003-SB-33D-10	003-SB-33D-11	003-SB-33D-12
DEPTH (feet):	65.0 - 70.0'	70.0 - 75.0'	80.0 - 85.0'	90.0 - 95.0'	105.0 - 110.0'	110.0 - 115.0'
SAMPLE DATE:	11/19/97	11/19/97	11/19/97	11/19/97	11/19/97	11/19/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D	MS-33D
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	120 U	120 U	110 U	120 U	110 U	110 U
STYRENE	120 U	120 U	110 U	120 U	110 U	110 U
TETRACHLOROETHENE	120 U	120 U	110 U	120 U	110 U	110 U
TOLUENE	120 U	6 J	6 J	9 J	6 J	9 J
TRANS-1,3-DICHLOROPROPENE	120 U	120 U	110 U	120 U	110 U	110 U
TRICHLOROETHENE	510	14000 J	100 J	10 J	110 U	110 U
VINYL CHLORIDE	120 U	120 U	110 U	120 U	110 U	110 U
XYLENES, TOTAL	7 J	11 J	110 U	13 J	9 J	14 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P01-05-BR	003-SB-P01-09-BR	003-SB-P02-05-BR	003-SB-DP1-23-BR	003-SB-P02-15-BR	003-SB-P06-05-BR
DEPTH (feet):	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	16.0 - 20.0'	56.0 - 60.0'	16.0 - 20.0'
SAMPLE DATE:	08/08/97	08/08/97	08/18/97	08/18/97	08/19/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P01	P01	P02	P02	P02	P06
FIELD DUPLICATE OF:				003-SB-P02-05-BR		

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	12 U	10 U	10 U	29 U	10 U
1,1,2,2-TETRACHLOROETHANE	11 U	12 U	10 U	10 U	29 U	10 U
1,1,2-TRICHLOROETHANE	11 U	12 U	10 U	10 U	29 U	10 U
1,1-DICHLOROETHANE	11 U	12 U	10 U	10 U	29 U	10 U
1,1-DICHLOROETHENE	11 U	12 U	10 U	10 U	29 U	10 U
1,2-DICHLOROETHANE	11 U	12 U	10 U	10 U	29 U	10 U
1,2-DICHLOROETHENE (TOTAL)	11 U	12 U	10 U	10 U	29 U	10 U
1,2-DICHLOROPROPANE	11 U	12 U	10 U	10 U	29 U	10 U
2-BUTANONE	11 U	2 J	10 U	10 U	29 U	3 J
2-HEXANONE	11 U	12 U	10 U	10 U	29 U	3 J
4-METHYL-2-PENTANONE	11 U	5 J	10 U	10 U	12 J	10 U
ACETONE	4 J	17	25 J	26 J	29 UJ	16
BENZENE	11 U	12 U	10 U	10 U	29 U	10 U
BROMODICHLOROMETHANE	11 U	12 U	10 U	10 U	29 U	10 U
BROMOFORM	11 U	12 U	10 U	10 U	29 U	10 U
BROMOMETHANE	11 U	12 U	10 U	10 U	29 U	10 U
CARBON DISULFIDE	11 U	12 U	10 U	10 U	29 U	10 U
CARBON TETRACHLORIDE	11 U	12 U	10 U	10 U	29 U	10 U
CHLOROBENZENE	11 U	12 U	10 U	10 U	29 U	1 J
CHLOROETHANE	11 U	12 U	10 UJ	10 UJ	29 U	10 U
CHLOROFORM	11 U	12 U	10 U	10 U	29 U	10 U
CHLOROMETHANE	11 U	12 U	10 U	10 U	29 U	10 U
CIS-1,3-DICHLOROPROPENE	11 U	12 U	10 U	10 U	29 U	10 U
DIBROMOCHLOROMETHANE	11 U	12 U	10 U	10 U	29 U	10 U
ETHYLBENZENE	11 U	12 U	10 U	10 U	29 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P01-05-BR	003-SB-P01-09-BR	003-SB-P02-05-BR	003-SB-DP1-23-BR	003-SB-P02-15-BR	003-SB-P06-05-BR
DEPTH (feet):	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	16.0 - 20.0'	56.0 - 60.0'	16.0 - 20.0'
SAMPLE DATE:	08/08/97	08/08/97	08/18/97	08/18/97	08/19/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P01	P01	P02	P02	P02	P06
FIELD DUPLICATE OF:				003-SB-P02-05-BR		

VOLATILES (µg/kg)

METHYLENE CHLORIDE	11 U	14 U	10 U	10 U	30 U	10 U
STYRENE	11 U	12 U	10 U	10 U	29 U	10 U
TETRACHLOROETHENE	11 U	12 U	10 U	10 U	29 U	10 U
TOLUENE	11 U	12 U	10 U	10 U	29 U	10 U
TRANS-1,3-DICHLOROPROPENE	11 U	12 U	10 U	10 U	29 U	10 U
TRICHLOROETHENE	11 UJ	12 UJ	10 U	10 U	5 J	10 UJ
VINYL CHLORIDE	11 U	12 U	10 U	10 U	29 U	10 U
XYLENES, TOTAL	11 U	12 U	10 U	10 U	29 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
1,1,2,2-TETRACHLOROETHANE	11 U	10 U	11 U	29 UJ	11 UJ	1500 U
1,1,2-TRICHLOROETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
1,1-DICHLOROETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
1,1-DICHLOROETHENE	11 U	10 U	11 U	29 U	11 U	1500 U
1,2-DICHLOROETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
1,2-DICHLOROETHENE (TOTAL)	6 J	10 U	11 U	29 U	1 J	1500 U
1,2-DICHLOROPROPANE	11 U	10 U	11 U	29 U	11 U	1500 U
2-BUTANONE	11	10 U	11 U	29 U	11 U	1500 U
2-HEXANONE	3 J	10 U	11 U	29 UJ	11 UJ	1500 U
4-METHYL-2-PENTANONE	7 J	10 U	10 J	29 U	11 U	1500 U
ACETONE	21	12	18	29 U	7 J	1500 U
BENZENE	11 U	10 U	11 U	29 U	11 U	1500 U
BROMODICHLOROMETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
BROMOFORM	11 U	10 U	11 U	29 U	11 U	1500 U
BROMOMETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
CARBON DISULFIDE	2 J	10 U	11 U	29 U	11 U	1500 U
CARBON TETRACHLORIDE	11 U	10 U	11 U	29 U	11 U	1500 U
CHLOROBENZENE	11 U	10 U	11 U	29 U	11 U	1500 U
CHLOROETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
CHLOROFORM	11 U	10 U	11 U	29 U	11 U	1500 U
CHLOROMETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
CIS-1,3-DICHLOROPROPENE	11 U	10 U	11 U	29 U	11 U	1500 U
DIBROMOCHLOROMETHANE	11 U	10 U	11 U	29 U	11 U	1500 U
ETHYLBENZENE	11 U	10 U	11 U	29 U	11 U	1500 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	11 U	10 U	11 U	29 U	11 U	1500 U
STYRENE	11 U	10 U	11 U	29 U	11 U	1500 U
TETRACHLOROETHENE	11 U	10 U	11 U	29 U	1 J	2300
TOLUENE	11 U	10 U	1 J	29 U	11 U	1500 U
TRANS-1,3-DICHLOROPROPENE	11 U	10 U	11 U	29 U	11 U	1500 U
TRICHLOROETHENE	11 UJ	10 U	10 J	29 UJ	9 J	55000
VINYL CHLORIDE	11 U	10 U	11 U	29 U	11 U	1500 U
XYLENES, TOTAL	11 U	10 U	11 U	29 U	11 U	1500 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE						370 U
1,2-DICHLOROBENZENE						370 U
1,3-DICHLOROBENZENE						370 U
1,4-DICHLOROBENZENE						370 U
2,2'-OXYBIS(1-CHLOROPROPANE)						370 U
2,4,5-TRICHLOROPHENOL						900 U
2,4,6-TRICHLOROPHENOL						370 U
2,4-DICHLOROPHENOL						370 U
2,4-DIMETHYLPHENOL						370 U
2,4-DINITROPHENOL						900 U
2,4-DINITROTOLUENE						370 U
2,6-DINITROTOLUENE						370 U
2-CHLORONAPHTHALENE						370 U
2-CHLOROPHENOL						370 U
2-METHYLNAPHTHALENE						370 U
2-METHYLPHENOL						370 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE						900 U
2-NITROPHENOL						370 U
3,3'-DICHLOROBENZIDINE						370 U
3-NITROANILINE						900 U
4,6-DINITRO-2-METHYLPHENOL						900 U
4-BROMOPHENYL PHENYL ETHER						370 U
4-CHLORO-3-METHYLPHENOL						370 U
4-CHLOROANILINE						370 U
4-CHLOROPHENYL PHENYL ETHER						370 U
4-METHYLPHENOL						370 U
4-NITROANILINE						900 U
4-NITROPHENOL						900 U
ACENAPHTHENE						370 U
ACENAPHTHYLENE						370 U
ANTHRACENE						370 U
BENZO(A)ANTHRACENE						370 U
BENZO(A)PYRENE						370 U
BENZO(B)FLUORANTHENE						370 U
BENZO(G,H,I)PERYLENE						370 U
BENZO(K)FLUORANTHENE						370 U
BIS(2-CHLOROETHOXY)METHANE						370 U
BIS(2-CHLOROETHYL)ETHER						370 U
BIS(2-ETHYLHEXYL)PHTHALATE						47
BUTYLBENZYL PHTHALATE						370 U
CARBAZOLE						370 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE						370 U
DI-N-BUTYL PHTHALATE						370 U
DI-N-OCTYL PHTHALATE						370 U
DIBENZO(A,H)ANTHRACENE						370 U
DIBENZOFURAN						370 U
DIETHYL PHTHALATE						370 U
DIMETHYL PHTHALATE						370 U
FLUORANTHENE						370 U
FLUORENE						370 U
HEXACHLORO BENZENE						370 U
HEXACHLOROBUTADIENE						370 U
HEXACHLOROCYCLOPENTADIENE						370 U
HEXACHLOROETHANE						370 U
INDENO(1,2,3-CD)PYRENE						370 U
ISOPHORONE						370 U
N-NITROSO-DI-N-PROPYLAMINE						370 U
N-NITROSODIPHENYLAMINE						370 U
NAPHTHALENE						370 U
NITROBENZENE						370 U
PENTACHLOROPHENOL						900 U
PHENANTHRENE						370 U
PHENOL						370 U
PYRENE						370 U

PCBs (µg/kg)

AROCLOR-1016						37 U
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1221						76 U
AROCLOR-1232						37 U
AROCLOR-1242						37 U
AROCLOR-1248						37 U
AROCLOR-1254						37 U
AROCLOR-1260						37 U

METALS (mg/kg)

ALUMINUM						5450
ANTIMONY						8.9 U
ARSENIC						2.6
BARIUM						55.2
BERYLLIUM						0.23
CADMIUM						0.53 U
CALCIUM						26300
CHROMIUM						15.9
COBALT						5.1
COPPER						11.8
CYANIDE						2.9
IRON						11100
LEAD						3.9
MAGNESIUM						11400
MANGANESE						327
MERCURY						0.05 U
NICKEL						20.5
POTASSIUM						963

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-SB-P06-07-BR	003-SB-P09-05-BR	003-SB-P09-09-BR	003-SB-P12-05-BR	003-SB-P12-11-BR	SB-01-1416
DEPTH (feet):	24.0 - 28.0'	16.0 - 20.0'	32.0 - 36.0'	16.0 - 20.0'	40.0 - 44.0'	14.0 - 16.0'
SAMPLE DATE:	08/07/97	08/23/97	08/24/97	08/10/97	08/11/97	04/10/95
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	EAST PLATING
LOCATION:	P06	P09	P09	P12	P12	SB-01/TW-01
FIELD DUPLICATE OF:						

METALS (mg/kg)

SELENIUM						0.71 U
SILVER						0.89 U
SODIUM						314
THALLIUM						0.89 U
VANADIUM						23.4
ZINC						26.1

GENERAL CHEMISTRY

PH						7.55
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

1,1,1-TRICHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
1,1,2,2-TETRACHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
1,1,2-TRICHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
1,1-DICHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
1,1-DICHLOROETHENE	56 U	11 U	10 U	11 U	7200 U	60 U
1,2-DICHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
1,2-DICHLOROETHENE (TOTAL)	56 U	11 U	10 U	11 U	7200 U	60 U
1,2-DICHLOROPROPANE	56 U	11 U	10 U	11 U	7200 U	60 U
2-BUTANONE	56 U	11 U	10 U	3	7200 U	60 U
2-HEXANONE	56 U	11 U	10 U	11 U	7200 U	60 U
4-METHYL-2-PENTANONE	56 U	11 U	10 U	11 U	7200 U	60 U
ACETONE	700	19 U	30 U	120	7200 U	60 U
BENZENE	56 U	11 U	10 U	11 U	7200 U	60 U
BROMODICHLOROMETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
BROMOFORM	56 U	11 U	10 U	11 U	7200 U	60 U
BROMOMETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
CARBON DISULFIDE	56 U	11 U	10 U	11 U	7200 U	60 U
CARBON TETRACHLORIDE	56 U	11 U	10 U	11 U	7200 U	60 U
CHLOROBENZENE	56 U	11 U	10 U	11 U	7200 U	60 U
CHLOROETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
CHLOROFORM	56 U	11 U	10 U	11 U	7200 U	60 U
CHLOROMETHANE	56 U	11 U	10 U	1	7200 U	60 U
CIS-1,3-DICHLOROPROPENE	56 U	11 U	10 U	11 U	7200 U	60 U
DIBROMOCHLOROMETHANE	56 U	11 U	10 U	11 U	7200 U	60 U
ETHYLBENZENE	56 U	11 U	10 U	11 U	7200 U	60 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

VOLATILES (µg/kg)

METHYLENE CHLORIDE	56 U	11 U	10 U	11 U	7200 U	60 U
STYRENE	56 U	11 U	10 U	11 U	7200 U	60 U
TETRACHLOROETHENE	56 U	1	10 U	11 U	3800	250
TOLUENE	56 U	11 U	10 U	11 U	7200 U	60 U
TRANS-1,3-DICHLOROPROPENE	56 U	11 U	10 U	11 U	7200 U	60 U
TRICHLOROETHENE	160	66	13	8	100000	13000
VINYL CHLORIDE	56 U	11 U	10 U	11 U	7200 U	60 U
XYLENES, TOTAL	56 U	11 U	10 U	11 U	7200 U	60 U

SEMIVOLATILES (µg/kg)

1,2,4-TRICHLOROBENZENE	360 U	370 U	350 U	350 U	370 U	380 U
1,2-DICHLOROBENZENE	360 U	370 U	350 U	350 U	370 U	380 U
1,3-DICHLOROBENZENE	360 U	370 U	350 U	350 U	370 U	380 U
1,4-DICHLOROBENZENE	360 U	370 U	350 U	350 U	370 U	380 U
2,2'-OXYBIS(1-CHLOROPROPANE)	360 U	370 U	350 U	350 U	370 U	380 U
2,4,5-TRICHLOROPHENOL	880 U	890 U	850 U	850 U	900 U	930 U
2,4,6-TRICHLOROPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
2,4-DICHLOROPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
2,4-DIMETHYLPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
2,4-DINITROPHENOL		890 U		850 U	900 U	930 U
2,4-DINITROTOLUENE		370 U		350 U	370 U	380 U
2,6-DINITROTOLUENE	360 U	370 U	350 U	350 U	370 U	380 U
2-CHLORONAPHTHALENE	360 U	370 U	350 U	350 U	370 U	380 U
2-CHLOROPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
2-METHYLNAPHTHALENE	360 U	370 U	350 U	350 U	370 U	380 U
2-METHYLPHENOL	360 U	370 U	350 U	350 U	370 U	380 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

2-NITROANILINE	880 U	890 U	850 U	850 U	900 U	930 U
2-NITROPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
3,3'-DICHLOROBENZIDINE		370 U		350 U	370 U	380 U
3-NITROANILINE	880 U	890 U	850 U	850 U	900 U	930 U
4,6-DINITRO-2-METHYLPHENOL		890 U		850 U	900 U	930 U
4-BROMOPHENYL PHENYL ETHER		370 U		350 U	370 U	380 U
4-CHLORO-3-METHYLPHENOL	360 U	370 U	350 U	350 U	370 U	380 U
4-CHLOROANILINE	360 U	370 U	350 U	350 U	370 U	380 U
4-CHLOROPHENYL PHENYL ETHER		370 U		350 U	370 U	380 U
4-METHYLPHENOL	360 U	370 U	350 U	350 U	320	380 U
4-NITROANILINE		890 U		850 U	900 U	930 U
4-NITROPHENOL		890 U		850 U	900 U	930 U
ACENAPHTHENE	360 U	370 U	350 U	350 U	370 U	380 U
ACENAPHTHYLENE	360 U	370 U	350 U	350 U	370 U	380 U
ANTHRACENE		370 U		350 U	370 U	380 U
BENZO(A)ANTHRACENE		370 U		350 U	370 U	380 U
BENZO(A)PYRENE		370 U		350 U	370 U	380 U
BENZO(B)FLUORANTHENE		370 U		350 U	370 U	380 U
BENZO(G,H,I)PERYLENE		370 U		350 U	370 U	380 U
BENZO(K)FLUORANTHENE		370 U		350 U	370 U	380 U
BIS(2-CHLOROETHOXY)METHANE	360 U	370 U	350 U	350 U	370 U	380 U
BIS(2-CHLOROETHYL)ETHER	360 U	370 U	350 U	350 U	370 U	380 U
BIS(2-ETHYLHEXYL)PHTHALATE		66		350 U	210	45
BUTYLBENZYL PHTHALATE		370 U		350 U	370 U	380 U
CARBAZOLE		370 U		350 U	370 U	380 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/kg)

CHRYSENE		370 U		350 U	370 U	380 U
DI-N-BUTYL PHTHALATE		370 U		350 U	43	380 U
DI-N-OCTYL PHTHALATE		370 U		350 U	370 U	380 U
DIBENZO(A,H)ANTHRACENE		370 U		350 U	370 U	380 U
DIBENZOFURAN		370 U		350 U	370 U	380 U
DIETHYL PHTHALATE		370 U		350 U	370 U	380 U
DIMETHYL PHTHALATE	360 U	370 U	350 U	350 U	370 U	380 U
FLUORANTHENE		370 U		350 U	370 U	380 U
FLUORENE		370 U		350 U	370 U	380 U
HEXACHLOROBENZENE		370 U		350 U	370 U	380 U
HEXACHLOROBUTADIENE	360 U	370 U	350 U	350 U	370 U	380 U
HEXACHLOROCYCLOPENTADIENE	360 U	370 U	350 U	350 U	370 U	380 U
HEXACHLOROETHANE	360 U	370 U	350 U	350 U	370 U	380 U
INDENO(1,2,3-CD)PYRENE		370 U		350 U	370 U	380 U
ISOPHORONE	360 U	370 U	350 U	350 U	370 U	380 U
N-NITROSO-DI-N-PROPYLAMINE	360 U	370 U	350 U	350 U	370 U	380 U
N-NITROSODIPHENYLAMINE		370 U		350 U	370 U	380 U
NAPHTHALENE	360 U	370 U	350 U	350 U	370 U	380 U
NITROBENZENE	360 U	370 U	350 U	350 U	370 U	380 U
PENTACHLOROPHENOL		890 U		850 U	900 U	930 U
PHENANTHRENE		370 U		350 U	370 U	380 U
PHENOL	360 U	370 U	350 U	350 U	370 U	380 U
PYRENE		370 U		350 U	370 U	380 U

PCBs (µg/kg)

AROCLOR-1016		37 U			74 U	38 U
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

PCBs (µg/kg)

AROCLOR-1221		74 U			150 U	78 U
AROCLOR-1232		37 U			74 U	38 U
AROCLOR-1242		37 U			74 U	38 U
AROCLOR-1248		37 U			74 U	38 U
AROCLOR-1254		37 U			74 U	38 U
AROCLOR-1260		37 U			74 U	38 U

METALS (mg/kg)

ALUMINUM	2490	2440	2540	1700	3940	1940
ANTIMONY	8.4 U	8.7 U	8.6 U	8.4 U	10.1 U	10 U
ARSENIC	0.78	1.1	0.78	0.46	2.8	0.84
BARIUM	12	9.9 U	8.3 U	6.6 U	47.4	8.6 U
BERYLLIUM	0.22	0.17 U	0.2	0.17	0.21	0.2 U
CADMIUM	0.51 U	0.7 U	0.52 U	0.5 U	0.6 U	0.6 U
CALCIUM	4710	13900	4520	3490	31900	4880
CHROMIUM	6.1 U	12.7	5.9 U	4.8 U	10.2 U	5.6 U
COBALT	3.1	5.1	3.2	2.2	5.4	2.4
COPPER	6.8	8.5	7	4.8	9.2 U	6.1 U
CYANIDE	1.1 U	1.1 U	1 U	1.1 U	1.1 U	1.1 U
IRON	6260	6920	6520	3920	9270	5120
LEAD	1.7	2.2	1.3	1.1	5.2	1.6
MAGNESIUM	2070	7660	2140	1480	11200	1850
MANGANESE	177	152	107	79.7	406	91.5
MERCURY	0.05 U	0.05 U	0.05 U	0.04 U	0.05 U	0.06 U
NICKEL	6.7 U	14 U	8.3 U	5.5 U	13 U	7 U
POTASSIUM	347	276	240	198	1130	251

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR SOILS - >12 FEET
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	SB-03-1214	SB-04-1214	SB-05-1315	SB-06-1214	SB-07-1416	SB-07-2830
DEPTH (feet):	12.0 - 14.0'	12.0 - 14.0'	13.0 - 15.0'	12.0 - 14.0'	14.0 - 16.0'	28.0 - 30.0'
SAMPLE DATE:	04/05/95	04/10/95	04/06/95	04/04/95	04/11/95	04/11/95
INVESTIGATION:	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING
LOCATION:	SB-03	SB-04/TW-02	SB-05	SB-06/TW-03	SB-07	SB-07
FIELD DUPLICATE OF:						

METALS (mg/kg)

SELENIUM	0.68 U	0.7 U	0.69 U	0.67 U	0.81 U	0.8 U
SILVER	0.84 U	0.87 U	0.86 U	0.84 U	1 U	1 U
SODIUM	92.8 U	84.2	95 U	70.6 U	337	81.8
THALLIUM	0.84 U	0.87 U	0.86 U	0.84 U	1 U	1 U
VANADIUM	14.1	12.5	12.4	9.4	15.2	12
ZINC	11.6	11.9	12.1	7.8 U	29.5	7.9 U

GENERAL CHEMISTRY

PH	8.21	8.36	8.62	8.53	8.66	8.32
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	2.9	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	0.6 J	1 U	3.5	1 U	1 U	33
1,1-DICHLOROETHENE	0.5 J	1.2	1 U	1 U	0.3 J	2
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	0.4 J
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 U	5 U	5 U	5 UR	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	12	47	46	0.2 J	0.3 J	490
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	4.3	1 U	1 U	1 U	16	1 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	0.3 J	6.5	2	1 U	1 U	17
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	200	81	94	15 J	8.9	1200
VINYL CHLORIDE	0.3 U	0.3	0.3 U	0.3 U	0.3 U	0.3

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,3-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,4-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	26 U	25 U	25 U	26 U	25 U	25 U
2,4,6-TRICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	26 U	25 UJ	25 U	26 U	25 UJ	25 U
2-NITROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	11 U	10 U	10 U	10 U	10 U	10 U
3-NITROANILINE	26 U	25 U	25 U	26 U	25 U	25 U
4,6-DINITRO-2-METHYLPHENOL	26 U	25 U	25 U	26 U	25 U	25 U
4-BROMOPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROANILINE	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
4-NITROANILINE	26 UJ	25 U	25 UJ	26 U	25 U	25 UJ
4-NITROPHENOL	26 U	25 U	25 UJ	26 U	25 U	25 U
ACENAPHTHENE	11 U	10 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	11 U	10 U	10 U	10 U	10 U	10 U
ANTHRACENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	11 U	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	11 UJ	10 UJ	10 UJ	10 U	10 UJ	10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	11 U	1 J	1 J	10 U	6 J	10 U
CARBAZOLE	11 UJ	10 U	10 UJ	10 U	10 U	10 UJ
CHRYSENE	11 U	10 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	11 U	10 U	1 J	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	11 U	10 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
FLUORANTHENE	11 U	10 U	10 U	10 U	10 U	10 U
FLUORENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
NAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U
NITROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
PHENANTHRENE	11 U	10 U	10 U	10 U	10 U	10 U
PHENOL	11 U	10 U	10 U	10 U	10 U	10 U
PYRENE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

PYRIDINE	11 UJ	10 UJ	10 UJ	10 U	10 UJ	10 UJ
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PCBs (µg/L)

AROCLOR-1016	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1221	1 U	1 U	1 U	1 U	1 U	1 U
AROCLOR-1232	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1242	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1248	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1254	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1260	0.5 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U

METALS (µg/L)

ALUMINUM	35 U	120 U	94.8 U	64.9 U	26.7 U	185 U
ANTIMONY	19 U	19 UJ	19 U	19 U	19 U	19 U
ARSENIC	2.5 U	1 U	2.1 U	1 U	1 U	3.4 U
BARIUM	55 J	37.1 J	70.1 J	12.7 J	40 J	39.2 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	170000 J	265000 J	139000 J	154000 J	106000 J	144000 J
CHROMIUM	15.1	17.7	8.7	13.2	15.1	17.5
COBALT	4.6 U	5 U	11.1 U	5.7 U	2 U	8.8 U
COPPER	3 U	3	3 U	3 U	3.2	3 U
CYANIDE	5 U	5 UJ	5 U	5 U	5 UJ	5 U
IRON	5350 J	4670 J	5310 J	1550 J	1170 J	4840 J
LEAD	1 UJ	1 UJ	1 U	1 U	1 UJ	1 U
MAGNESIUM	42900 J	81900 J	27500 J	29500 J	25500 J	24000 J
MANGANESE	686	1080 J	1170	812 J	102 J	1430

Blank space Indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-01	003-TW-004-01	003-TW-006-01	003-TW-007-01	003-TW-008-01	003-TW-013-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/14/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.26	0.2 U	0.2 U
NICKEL	5.1	10.4 J	21.4	15	7.6	12.3
POTASSIUM	2900	6090 J	5080	2990 J	2510 J	4130
SELENIUM	1 UJ	1 UJ	1 UJ	1.9 J	51.8	5 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	7610 J	13900 J	22400 J	9290	10900 J	8990 J
THALLIUM	1 UJ	1 UJ	1 U	1 UJ	1 UJ	1 UJ
VANADIUM	2 U	3.6 U	2 U	2 U	4 U	2 U
ZINC	12.9 U	26.8 U	55.4 J	9.2 U	26 U	21.8 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	6	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	0.3 J	1 U
1,1-DICHLOROETHANE	1 U	34	110	3.2	0.8 J	2.6
1,1-DICHLOROETHENE	1 U	4.2	6.7	0.3 J	4.1	0.7 J
1,2-DICHLOROETHANE	1 U	0.4 J	0.9 J	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 U	5 U	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	0.2 J	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 UJ	1 U	1 U	1 U	1 U	1 UJ
BROMOMETHANE	1 U	1 U	1 U	1 U	1 UJ	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	0.3 J	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	600	1500	330	3.8	8.8
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	46

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	60
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	37
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	3.8	0.7 J	0.5 J	0.3 J	13
TOLUENE	1 U	1 U	1 U	1 U	1 U	3.5 U
TRANS-1,2-DICHLOROETHENE	1 U	35	36	37	1 J	0.3 J
TRANS-1,3-DICHLOROPROPENE	1 UJ	1 U	1 U	1 U	1 U	1 UJ
TRICHLOROETHENE	2.3	1000	2000	33	110	44
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3	0.3 U	0.4

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,3-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,4-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	27 U	25 U	25 U	25 U	26 U	26 U
2,4,6-TRICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	11 U	10 U	10 U	25 U	26 U	10 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	11 U	10 U	10 U	10 U	10 U	2 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	27 U	25 U	25 U	25 U	26 U	26 U
2-NITROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	11 U	10 U	10 UJ	10 U	10 U	10 U
3-NITROANILINE	27 U	25 U	25 UJ	25 U	26 U	26 U
4,6-DINITRO-2-METHYLPHENOL	27 U	25 U	25 U	25 U	26 U	26 U
4-BROMOPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROANILINE	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
4-NITROANILINE	27 U	25 U	25 UJ	25 U	26 U	26 U
4-NITROPHENOL	27 U	25 U	25 UJ	25 U	26 U	26 U
ACENAPHTHENE	11 U	10 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	11 U	10 U	10 U	10 U	10 U	10 U
ANTHRACENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	11 U	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	11 U	10 U	10 U	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	11 U	10 U	10 U	10 U	1 J	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
CARBAZOLE	11 U	10 U	10 U	10 U	10 U	10 U
CHRYSENE	11 U	10 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	11 U	10 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
FLUORANTHENE	11 U	10 U	10 U	10 U	10 U	10 U
FLUORENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
NAPHTHALENE	11 U	10 U	10 U	10 U	10 U	120
NITROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	11 U	10 U	10 U	25 U	26 U	3 J
PHENANTHRENE	11 U	10 U	10 U	10 U	10 U	10 U
PHENOL	6 J	10 U	10 U	10 U	10 U	10 U
PYRENE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

PYRIDINE	11 U	10 UJ	10 UJ	10 U	10 U	10 U
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PCBs (µg/L)

AROCLOR-1016	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U
AROCLOR-1221	1 U	1 U	1 U	1 U	1 U	1 U
AROCLOR-1232	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U
AROCLOR-1242	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U
AROCLOR-1248	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U
AROCLOR-1254	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U
AROCLOR-1260	0.52 U	0.5 U	0.5 U	0.52 U	0.5 U	0.5 U

METALS (µg/L)

ALUMINUM	26 U	1060 J	80.4 U	662 J	191	61.9
ANTIMONY	16 U	19 U	19 U	19 U	19 U	16 U
ARSENIC	1 U	1 J	1 U	2.7 U	1 U	4.9
BARIUM	14.7	67.1 J	76 J	64.3 J	61	59.1 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2.5 U	2 U
CALCIUM	73400	202000 J	188000 J	185000 J	114000	146000
CHROMIUM	6 U	32.2	11.6	25.1	18.2 U	8.6
COBALT	5 U	10.8	9	11.8 U	2 U	5 U
COPPER	3 U	5.9	3 U	8	3 U	3.8
CYANIDE	5 U	5 U	5 U	5 U	5 U	5 U
IRON	866 J	16300 J	4430 J	12100 J	2980 J	13300 J
LEAD	1 U	4.1	3	3.2	1 U	1 U
MAGNESIUM	17900	44500 J	31300 J	41500 J	27100 J	42800
MANGANESE	125 J	1150 J	1620 J	3200 J	794 J	865 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-01	003-TW-016-01	003-TW-017-01	003-TW-018-01	003-TW-023-01	003-TW-026-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	5.1 U	45.8 J	24.8 J	33.3 J	4 U	5 U
POTASSIUM	2530	4700 J	4440 J	4510 J	3530	3850
SELENIUM	44.8 J	5 UJ	1 UJ	1 UJ	20 J	1 UR
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	9370 J	9220 J	12000 J	6260 J	8020 J	12800 J
THALLIUM	1 UJ	1 U	1 U	1 UJ	1 U	1 U
VANADIUM	2 U	6.9 U	2 U	4	2.1	2 U
ZINC	8.6 U	122 J	13.6 U	77.8 J	33.5 J	11.3 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	13	12	11	0.5 J
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	3	0.3 J	0.4 J	0.4 J	1.9
1,1-DICHLOROETHENE	1 U	4.9	8.2	6.1	5.4	1 U
1,2-DICHLOROETHANE	1 U	0.3 J	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 UJ	1 UJ	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	1 U	44	1 U	1 U	1 U	300
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	0.2 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	0.8 J
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	0.7 J
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	2.8	1 U	1 U	20
TOLUENE	1 U	1 U	1 U	1 U	1 U	0.4 J
TRANS-1,2-DICHLOROETHENE	0.3 J	110	1 U	1 U	1 U	10
TRANS-1,3-DICHLOROPROPENE	1 U	1 UJ	1 UJ	1 U	1 U	1 U
TRICHLOROETHENE	46	260	8.2	3.8	3.9	51
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,3-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
1,4-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	26 U	26 U	25 U	25 U	26 U	26 U
2,4,6-TRICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	26 U	26 U	25 U	25 U	26 U	26 U
2-NITROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	11 U	10 U	10 U	10 U	10 U	10 U
3-NITROANILINE	26 U	26 U	25 U	25 U	26 U	26 U
4,6-DINITRO-2-METHYLPHENOL	26 U	26 U	25 U	25 U	26 U	26 U
4-BROMOPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	9 J
4-CHLOROANILINE	11 U	10 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
4-NITROANILINE	26 U	26 U	25 U	25 U	26 UJ	26 UJ
4-NITROPHENOL	26 U	26 U	25 U	25 U	26 U	26 U
ACENAPHTHENE	11 U	10 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	11 U	10 U	10 U	10 U	10 U	10 U
ANTHRACENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	11 U	10 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	11 U	10 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	11 U	10 U	10 U	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	1 J
CARBAZOLE	11 U	10 U	10 U	10 U	10 U	10 U
CHRYSENE	11 U	10 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	11 U	10 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	1 J
DIMETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 UJ	10 UJ
FLUORANTHENE	11 U	10 U	10 U	10 U	10 U	10 U
FLUORENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	11 U	10 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	11 U	10 U	10 U	10 U	10 U	10 U
NAPHTHALENE	11 U	10 U	10 U	10 U	10 U	1 J
NITROBENZENE	11 U	10 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	10 U
PHENANTHRENE	11 U	10 U	10 U	10 U	10 U	10 U
PHENOL	11 U	10 U	10 U	10 U	10 U	10 U
PYRENE	11 U	10 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

SEMIVOLATILES (µg/L)

PYRIDINE	11 U	10 U	10 U	10 U	10 U	10 U
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PCBs (µg/L)

AROCLOR-1016	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1221	1 U	1 U	1 U	1 U	1 U	1 U
AROCLOR-1232	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1242	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1248	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1254	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U
AROCLOR-1260	0.52 U	0.5 U	0.5 U	0.51 U	0.5 U	0.5 U

METALS (µg/L)

ALUMINUM	18 U	26 U	26 U	82.1 U	43.1 U	671 J
ANTIMONY	19 U	16 U	16 U	19 U	19 U	19 U
ARSENIC	1 U	2.1 J	1 U	1 U	1 U	1 U
BARIUM	42.3 J	37.8 J	57.3 J	27.9 J	28 J	38.8 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	76300 J	118000 J	67800 J	50500 J	50500 J	135000 J
CHROMIUM	6 U	6 U	8.1	7	7.1	15.4
COBALT	2 U	5 U	5 U	2 U	2 U	12.2 U
COPPER	6.2	3 U	7.3 U	3 U	3 U	3 U
CYANIDE	5 U	5 U	5 U	5 U	5 U	5 U
IRON	1390 J	2190 J	552 J	800 J	751 J	7520 J
LEAD	1 UJ	1 U	1 U	1 UJ	1 UJ	1.2 J
MAGNESIUM	16000 J	27000 J	15800 J	10500 J	10500 J	24900 J
MANGANESE	55 J	797 J	32.4 J	24.6 J	23.4 J	1540 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-01	003-TW-028-01	003-TW-029-01	003-TW-030-01	003-TW-DP1-03	003-TW-032-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-01	

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	4 U	5 U	5 U	4 U	4 U	17.4
POTASSIUM	2650 J	3030	3070	2170 J	2240 J	3650 J
SELENIUM	23 J	5 UR	29.2 J	8.7 J	12.2 J	1.4 U
SILVER	5 U	3 U	3 U	3.8 U	3 U	3 U
SODIUM	10300	8050 J	44600 J	38300	38700 J	17900
THALLIUM	1 UJ	1.7 U	1 U	1 UJ	1 UJ	2.7 U
VANADIUM	2 U	2.3 U	2 U	2 U	2 U	3.8 U
ZINC	9.3 U	4.7 U	4 U	8.6 U	8.9 U	17.1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	690	0.2 J	1 U	1 U	6.8	1 U
1,1,2,2-TETRACHLOROETHANE	5 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 J	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	14	1 U	1 U	1 U	1.9	1.2
1,1-DICHLOROETHENE	380	1 U	1 U	1 U	0.2 J	0.6 J
1,2-DICHLOROETHANE	8.2	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	5 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	25 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	25 UR	5 UR	5 UR	5 UR	5 UR	5 U
4-METHYL-2-PENTANONE	25 U	5 U	5 U	5 U	5 U	5 U
ACETONE	25 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	5 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	5 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	5 U	1 U	1 U	1 UJ	1 U	1 U
BROMOMETHANE	5 U	1 U	1 U	1 U	1 UJ	1 U
CARBON DISULFIDE	5 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	5 U	1 U	1 U	1 UJ	1 U	1 U
CHLOROBENZENE	5 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	5 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	5 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	5 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	5 U	3.6	1 U	1 U	8.3	44
CIS-1,3-DICHLOROPROPENE	5 U	1 U	1 U	1 UJ	1 U	1 U
DIBROMOCHLOROMETHANE	5 U	1 U	1 U	1 UJ	1 U	1 U
ETHYLBENZENE	5 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

M+P-XYLENES	5 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	10 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	5 U	1 U	1 U	1 U	1 U	1 U
STYRENE	5 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	5 U	1 U	1 U	0.4 J	1.9	1 U
TOLUENE	5 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	5 U	0.3 J	1 U	1 U	0.3 J	0.2 J
TRANS-1,3-DICHLOROPROPENE	5 U	1 U	1 U	1 UJ	1 U	1 U
TRICHLOROETHENE	12	110	20	1 U	88	55
VINYL CHLORIDE	1.5 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
1,2-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
1,3-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
1,4-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
2,4,5-TRICHLOROPHENOL	26 U	25 U	25 U	26 U	27 U	25 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
2,4-DINITROPHENOL	10 U	25 U	25 U	10 U	11 U	10 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U	11 U	10 U
2-CHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U	11 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	26 U	25 U	25 U	26 U	27 U	25 UJ
2-NITROPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U	10 U	11 U	10 U
3-NITROANILINE	26 U	25 U	25 U	26 U	27 U	25 U
4,6-DINITRO-2-METHYLPHENOL	26 U	25 U	25 U	26 U	27 U	25 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	11 U	10 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
4-CHLOROANILINE	10 U	10 U	10 U	10 U	11 U	10 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	11 U	10 U
4-METHYLPHENOL	10 U	10 U	10 U	10 U	11 U	10 U
4-NITROANILINE	26 U	25 U	25 U	26 U	27 U	25 U
4-NITROPHENOL	26 U	25 U	25 U	26 U	27 U	25 U
ACENAPHTHENE	10 U	10 U	10 U	10 U	11 U	10 U
ACENAPHTHYLENE	10 U	10 U	10 U	10 U	11 U	10 U
ANTHRACENE	10 U	10 U	10 U	10 U	11 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U	11 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U	11 U	10 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	10 UJ	10 U	10 U	10 U	11 U	10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U	1 J	11 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	10 U
CARBAZOLE	10 U	10 U	10 U	10 U	11 U	10 U
CHRYSENE	10 U	10 U	10 U	10 U	11 U	10 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	10 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	10 U	10 U	10 U	10 U	11 U	10 U
DIETHYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	10 U
DIMETHYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	10 U
FLUORANTHENE	10 U	10 U	10 U	10 U	11 U	10 U
FLUORENE	10 U	10 U	10 U	10 U	11 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	10 U	11 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	10 U	10 U	10 U	10 U	11 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	10 U	11 U	10 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U	11 U	10 U
NAPHTHALENE	10 U	10 U	10 U	10 U	11 U	10 U
NITROBENZENE	10 U	10 U	10 U	10 U	11 U	10 U
PENTACHLOROPHENOL	10 U	25 U	25 U	10 U	11 U	10 U
PHENANTHRENE	10 U	10 U	10 U	10 U	11 U	10 U
PHENOL	10 U	10 U	10 U	10 U	11 U	10 U
PYRENE	10 U	10 U	10 U	10 U	11 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

PYRIDINE	10 UJ	10 U	10 U	10 U	11 U	10 UJ
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PCBs (µg/L)

AROCLOR-1016	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U
AROCLOR-1221	1 U	1 U	1 U	1 U	1 U	1 U
AROCLOR-1232	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U
AROCLOR-1242	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U
AROCLOR-1248	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U
AROCLOR-1254	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U
AROCLOR-1260	0.51 U	0.5 U	0.5 U	0.51 U	0.51 U	0.5 U

METALS (µg/L)

ALUMINUM	26 U	190 J	147 J	6110	93.5	18 U
ANTIMONY	16 U	19 U	19 U	19 U	19 U	19 U
ARSENIC	1 U	1 U	1.1 U	7.4 J	1 U	1
BARIUM	55.9 J	125 J	67.9 J	152	107 J	84.4 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.7	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	87000 J	156000 J	81700 J	93600	187000 J	180000 J
CHROMIUM	8	17.9	15	79.9 J	17.3 U	8.5
COBALT	5 U	2 U	2 U	57.3	2.4 U	13.2 J
COPPER	3 U	3 U	3 U	40.1	3 U	3 U
CYANIDE	5 U	5 U	5 U	5 U	5 UR	5 UJ
IRON	515 J	2510 J	2430 J	25900 J	2520 J	4670 J
LEAD	1 U	1 U	1 U	17.7 J	1 U	1.2 U
MAGNESIUM	20200 J	35200 J	15200 J	29100 J	40100 J	48400 J
MANGANESE	19.5 J	20.7 J	34.9 J	1690 J	196 J	1360 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-01	003-TW-034-01	003-TW-035-01	003-TW-036-01	003-TW-037-01	003-TW-038-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	5 U	4 U	4 U	87.9	4.3 U	6.4
POTASSIUM	4310	3800 J	3860 J	6110	3890 J	3620 J
SELENIUM	65 J	52 J	19.6 J	142 J	72.4 J	5 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	34600 J	27400 J	44100 J	101000 J	14100 J	11300 J
THALLIUM	1 UJ	1 UJ	1 UJ	1 UJ	1.8 J	1 UJ
VANADIUM	2 U	2.9	2 U	40.5	2 U	2 U
ZINC	4.4 U	20.5 U	28.9 U	121 J	8.4 U	36.8 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	8.9	1.7	1 U	1 U	1 U	12
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	0.2 J	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	2.4	0.3 J	5	4.7	6.7	0.9 J
1,1-DICHLOROETHENE	0.5 J	0.5 J	2	2	2.6	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 UJ
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	0.7 J	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	0.2 J	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	140	1.6	430	440	230	1.4
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	0.6 J	0.2 J	1.1	1	0.3 J	2.1
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	4	1 U	240	230	54	1 U
TRANS-1,3-DICHLOROPROPENE	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 U
TRICHLOROETHENE	78	25	230	240	110	70
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3	0.3 U	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	10 U	11 U	10 U	10 U	10 U	10 U
1,2-DICHLOROBENZENE	10 U	11 U	10 U	10 U	10 U	10 U
1,3-DICHLOROBENZENE	10 U	11 U	10 U	10 U	10 U	10 U
1,4-DICHLOROBENZENE	10 U	11 U	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	26 U	27 U	25 U	25 U	26 U	25 U
2,4,6-TRICHLOROPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	10 U	11 U	10 U	10 U	10 U	25 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	10 U	11 U	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	10 U	11 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	26 U	27 U	25 U	25 U	26 U	25 U
2-NITROPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	10 U	11 U	10 U	10 U	10 U	10 U
3-NITROANILINE	26 U	27 U	25 U	25 U	26 U	25 U
4,6-DINITRO-2-METHYLPHENOL	26 U	27 U	25 U	25 U	26 U	25 U
4-BROMOPHENYL PHENYL ETHER	10 U	11 U	10 U	10 U	10 U	10 U
4-CHLORO-3-METHYLPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
4-CHLOROANILINE	10 U	11 U	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	10 U	11 U	10 U	10 U	10 U	10 U
4-METHYLPHENOL	10 U	11 U	10 U	10 U	10 U	10 U
4-NITROANILINE	26 U	27 U	25 U	25 U	26 U	25 U
4-NITROPHENOL	26 U	27 U	25 U	25 U	26 U	25 U
ACENAPHTHENE	10 U	11 U	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	10 U	11 U	10 U	10 U	10 U	10 U
ANTHRACENE	10 U	11 U	10 U	10 U	10 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	10 U	11 U	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	10 U	11 U	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	10 U	11 U	10 U	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U
CARBAZOLE	10 U	11 U	10 U	10 U	10 U	10 U
CHRYSENE	10 U	11 U	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	10 U	11 U	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	10 U	11 U	10 U	10 U	10 U	10 U
FLUORANTHENE	10 U	11 U	10 U	10 U	10 U	10 U
FLUORENE	10 U	11 U	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	10 U	11 U	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	10 U	11 U	10 U	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	11 U	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	10 U	11 U	10 U	10 U	10 U	10 U
NAPHTHALENE	10 U	11 U	10 U	10 U	10 U	10 U
NITROBENZENE	10 U	11 U	10 U	10 U	10 U	10 U
PENTACHLOROPHENOL	10 U	11 U	1 J	10 U	10 U	25 U
PHENANTHRENE	10 U	11 U	10 U	10 U	10 U	10 U
PHENOL	10 U	11 U	10 U	10 U	10 U	10 U
PYRENE	10 U	11 U	10 U	10 U	10 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

SEMIVOLATILES (µg/L)

PYRIDINE	10 U	11 U	10 U	10 U	10 U	10 UJ
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PCBs (µg/L)

AROCLOR-1016	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U
AROCLOR-1221	1 U	1.1 U	1.1 U	1 U	1.01 U	1 U
AROCLOR-1232	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U
AROCLOR-1242	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U
AROCLOR-1248	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U
AROCLOR-1254	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U
AROCLOR-1260	0.5 U	0.53 U	0.53 U	0.5 U	0.505 U	0.5 U

METALS (µg/L)

ALUMINUM	1060 J	26 U	26 U	26 U	678 J	257 J
ANTIMONY	16 U	16 U	16 U	16 U	16 U	19 U
ARSENIC	2	1 U	2.2 U	1 U	1	1 U
BARIUM	49.6 J	45.1 J	112	110	61.9 J	98 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	184000 J	66000	202000	203000	194000 J	149000 J
CHROMIUM	20.6	7.1	14.4	13.7	28.8	16
COBALT	12.8	5 U	5 U	5 U	5 U	2 U
COPPER	6.8	3 U	3 U	3 U	3.4	3.1
CYANIDE	5 U	5 U	5 U	5 U	5 U	5 U
IRON	4630 J	1050 J	2070 J	2100 J	6180 J	3860 J
LEAD	3	1 U	1 U	1 U	1 U	1 U
MAGNESIUM	53100 J	15400	49500	49100	36100 J	29400 J
MANGANESE	1280	212 J	679 J	680 J	930	158 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-01	003-TW-046-01	003-TW-047-01	003-TW-DP1-05	003-TW-050-01	003-TW-054-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-01		

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	27.3	5 U	9.4 U	8.4 U	6.6	4 U
POTASSIUM	4890	3570	3670	3630	4010	4040 J
SELENIUM	1 UJ	35.3 J	1 UJ	1 UJ	1 UJ	9.5 J
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	11500 J	51900 J	107000 J	106000 J	15300 J	38300 J
THALLIUM	1.4 U	1 UJ	1 UJ	1 UJ	1.6 U	1 UJ
VANADIUM	8.3 U	2 U	2 U	2 U	5.2 U	3.3
ZINC	21.3 U	6.3 U	13.1 U	12.7 U	32 U	36.9 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	3.4	11	0.6 J	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	0.9 J	1.1	1 U	3	13	1 U
1,1-DICHLOROETHENE	0.4 J	0.7 J	1 U	1.4	2.2	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 U	5 UR	0.2 J	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 UJ	1 U	1 UJ
BROMOMETHANE	1 U	1 U	1 UJ	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	0.2 J	1 U	1 U
CIS-1,2-DICHLOROETHENE	9.7	0.7 J	1 U	290	1000	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 UJ	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	2.5	1 U	1 U	1	1 U	1 U
TOLUENE	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1 U	0.4 J	1 U	130	33	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 UJ	1 UJ	1 UJ
TRICHLOROETHENE	68	71	0.6 J	540	860	1 U
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 J	1.1	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	11 U	11 U	11 U	10 U	10 U	11 U
1,2-DICHLOROBENZENE	11 U	11 U	11 U	10 U	10 U	11 U
1,3-DICHLOROBENZENE	11 U	11 U	11 U	10 U	10 U	11 U
1,4-DICHLOROBENZENE	11 U	11 U	11 U	10 U	10 U	11 U
2,4,5-TRICHLOROPHENOL	27 U	26 U	26 U	26 U	26 U	26 U
2,4,6-TRICHLOROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
2,4-DICHLOROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
2,4-DIMETHYLPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
2,4-DINITROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	11 U	11 U	11 U	10 U	10 U	11 U
2-CHLOROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
2-METHYLNAPHTHALENE	11 U	11 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	27 U	26 U	26 U	26 U	26 U	26 U
2-NITROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
3,3'-DICHLOROBENZIDINE	11 U	11 U	11 U	10 U	10 U	11 U
3-NITROANILINE	27 U	26 U	26 U	26 U	26 U	26 U
4,6-DINITRO-2-METHYLPHENOL	27 U	26 U	26 U	26 U	26 U	26 U
4-BROMOPHENYL PHENYL ETHER	11 U	11 U	11 U	10 U	10 U	11 U
4-CHLORO-3-METHYLPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
4-CHLOROANILINE	11 U	11 U	11 U	10 U	10 U	11 U
4-CHLOROPHENYL PHENYL ETHER	11 U	11 U	11 U	10 U	10 U	11 U
4-METHYLPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
4-NITROANILINE	27 U	26 U	26 U	26 U	26 U	26 U
4-NITROPHENOL	27 U	26 U	26 U	26 U	26 U	26 U
ACENAPHTHENE	11 U	11 U	11 U	10 U	10 U	11 U
ACENAPHTHYLENE	11 U	11 U	11 U	10 U	10 U	11 U
ANTHRACENE	11 U	11 U	11 U	10 U	10 U	11 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	11 U	11 U	11 U	10 U	10 U	11 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	11 U	11 U	11 U	10 U	10 U	11 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	11 U	11 U	11 U	10 U	10 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE	11 U	11 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	11 U	11 U	11 U	10 U	10 U	11 U
CARBAZOLE	11 U	11 U	11 U	10 U	10 U	11 U
CHRYSENE	11 U	11 U	11 U	10 U	10 U	11 U
DI-N-BUTYL PHTHALATE	11 U	11 U	11 U	10 U	10 U	11 U
DI-N-OCTYL PHTHALATE	11 U	11 U	11 U	10 U	1 J	11 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	11 U	11 U	11 U	10 U	10 U	11 U
DIETHYL PHTHALATE	11 U	11 U	11 U	10 U	10 U	11 U
DIMETHYL PHTHALATE	11 UJ	11 U	11 U	10 U	10 U	11 U
FLUORANTHENE	11 U	11 U	11 U	10 U	10 U	11 U
FLUORENE	11 U	11 U	11 U	10 U	10 U	11 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	11 U	11 U	11 U	10 U	10 U	11 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	11 U	11 U	11 U	10 U	10 U	11 U
N-NITROSO-DI-N-PROPYLAMINE	11 U	11 U	11 U	10 U	10 U	11 U
N-NITROSODIPHENYLAMINE	11 U	11 U	11 U	10 U	10 U	11 U
NAPHTHALENE	11 U	11 U	11 U	10 U	10 U	11 U
NITROBENZENE	11 U	11 U	11 U	10 U	10 U	11 U
PENTACHLOROPHENOL	11 U	11 U	11 U	10 U	10 U	11 U
PHENANTHRENE	11 U	11 U	11 U	10 U	10 U	11 U
PHENOL	11 U	11 U	11 U	10 U	10 U	5 J
PYRENE	11 U	11 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

PYRIDINE	11 U	11 U	11 U	10 U	10 UJ	11 U
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PCBs (µg/L)

AROCLOR-1016	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U
AROCLOR-1221	1.1 U	1 U	1.1 U	1 U	1 U	1 U
AROCLOR-1232	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U
AROCLOR-1242	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U
AROCLOR-1248	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U
AROCLOR-1254	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U
AROCLOR-1260	0.53 U	0.5 U	0.54 U	0.52 U	0.5 U	0.51 U

METALS (µg/L)

ALUMINUM	27.5 U	538 J	18 U	124	196 U	26 U
ANTIMONY	19 U	19 U	19 U	16 U	16 U	16 U
ARSENIC	1 U	1 U	1 U	1.6	1 U	1 U
BARIUM	110 J	26.5 J	35.8 J	67.2 J	85.2 J	67.8 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	140000 J	76900 J	112000 J	195000	226000 J	142000
CHROMIUM	10	16 U	8.5 U	16.9	25.7	7.3
COBALT	2.5 U	2 U	2.9 U	5 U	7.5	5 U
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
CYANIDE	5 U	5 U	5 UR	5 U	5 U	5 U
IRON	1470 J	5480 J	1210 J	3160 J	6000 J	1850 J
LEAD	1 UJ	1 U	1 U	1 U	1.4	1 U
MAGNESIUM	22900 J	20300 J	23400 J	45700	46200 J	35700
MANGANESE	278 J	551 J	61 J	441 J	1430 J	1090 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-01	003-TW-058-01	003-TW-063-01	003-TW-068-01	003-TW-070-01	003-TW-071-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	8.4	4 U	4 U	5 U	9.5	5 U
POTASSIUM	4610 J	3550	2220 J	2350	3560	2920
SELENIUM	78.6 J	74 J	11.9 U	1 UR	1 UJ	1 UR
SILVER	3 U	3 U	3 U	3 U	3.7 U	3 U
SODIUM	49000 J	19300 J	13700 J	44500 J	9170 J	8270 J
THALLIUM	1 UJ	1 U	1 U	1 UJ	1 U	1 U
VANADIUM	2 U	4.2 U	2.9	2 U	2.3	2 U
ZINC	8.2 U	15.9 U	5.7 U	12.7 U	21.2 U	8 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	0.5 J	0.5 J	22	0.9 J	8.4	1 U
1,1-DICHLOROETHENE	0.3 J	0.5 J	3.1	0.3 J	1.9	1.9
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 U	5 U	5 U	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	1 U	0.2 J	1 U	1 U
CIS-1,2-DICHLOROETHENE	86	85	330	11	140	120
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	0.6 J	5.9	1 U	1 U
TOLUENE	1 U	1 U	1 U	0.2 J	1 U	0.5 J
TRANS-1,2-DICHLOROETHENE	3.6	3.3	19	0.5 J	2.7	31
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	120	120	860	61	150	150
VINYL CHLORIDE	0.3 U	0.3 U	0.2 J	0.3 U	0.8	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	10 U	10 U	10 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	10 U	10 U	10 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	10 U	10 U	10 U	5 U	5 U	5 U
2,2'-OXYBIS(1-CHLOROPROPANE)				1 U	1 U	1 U
2,4,5-TRICHLOROPHENOL	25 U	25 U	25 U	20 U	20 U	20 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
2,4-DINITROPHENOL	10 U	10 U	25 U	20 U	20 U	20 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	5 U	5 U	5 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U	5 U	5 U	5 U
2-CHLOROPHENOL	10 U	10 U	10 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

SEMIVOLATILES (µg/L)

2-METHYLNAPHTHALENE	10 U	10 U	10 U	5 U	5 U	5 U
2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	25 UJ	25 U	25 U	20 U	20 U	20 U
2-NITROPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U	5 UJ	5 UJ	5 UJ
3-NITROANILINE	25 U	25 U	25 U	20 U	20 U	20 U
4,6-DINITRO-2-METHYLPHENOL	25 U	25 U	25 U	20 U	20 U	20 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
4-CHLOROANILINE	10 U	10 U	10 U	5 U	5 U	5 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	5 U	5 U	5 U
4-METHYLPHENOL	10 U	10 U	10 U	5 U	5 U	5 U
4-NITROANILINE	25 U	25 U	25 U	20 U	20 U	20 U
4-NITROPHENOL	25 U	25 U	25 U	20 UJ	20 UJ	20 UJ
ACENAPHTHENE	10 U	10 U	10 U	5 U	5 U	5 U
ACENAPHTHYLENE	10 U	10 U	10 U	5 U	5 U	5 U
ANTHRACENE	10 U	10 U	10 U	5 U	5 U	5 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	5 U	5 U	5 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	5 U	5 U	5 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	5 U	5 U	5 U
BIS(2-CHLOROISOPROPYL) ETHER	10 UJ	10 U	10 U			

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

SEMIVOLATILES (µg/L)

BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U	5 U	5 U	5 U
BUTYLBENZYL PHTHALATE	10 UJ	10 U	10 U	5 U	5 U	5 U
CARBAZOLE	10 U	10 U	10 U	5 UJ	5 UJ	5 UJ
CHRYSENE	10 U	10 U	10 U	5 U	5 U	5 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U	1 J	5 U	5 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	5 U	5 U	5 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	10 U	10 U	10 U	5 U	5 U	5 U
DIETHYL PHTHALATE	10 U	10 U	10 U	5 U	5 U	5 U
DIMETHYL PHTHALATE	10 U	10 U	10 U	5 U	5 U	5 U
FLUORANTHENE	10 U	10 U	10 U	5 U	5 U	5 U
FLUORENE	10 U	10 U	10 U	5 U	5 U	5 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	5 U	5 U	5 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	10 U	10 U	10 U	5 U	5 U	5 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	5 U	5 U	5 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	5 U	5 U	5 U
NAPHTHALENE	10 U	10 U	10 U	5 U	5 U	5 U
NITROBENZENE	10 U	10 U	10 U	5 U	5 U	5 U
PENTACHLOROPHENOL	10 U	10 U	25 U	10 U	10 U	10 U
PHENANTHRENE	10 U	10 U	10 U	5 U	5 U	5 U
PHENOL	10 U	10 U	10 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

SEMIVOLATILES (µg/L)

PYRENE	10 U	10 U	10 U	5 U	5 U	5 U
PYRIDINE	10 UJ	10 UJ	10 U			

PCBs (µg/L)

AROCLOR-1016	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U
AROCLOR-1221	1 U	1 U	1 U	0.4 U	0.4 U	0.4 U
AROCLOR-1232	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U
AROCLOR-1242	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U
AROCLOR-1248	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U
AROCLOR-1254	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	0.5 U	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U

METALS (µg/L)

ALUMINUM	750 J	920 J	139 J	28 U	28 U	28 U
ANTIMONY	19 U	19 U	19 U	14 U	14 U	14 U
ARSENIC	3.6	3	1.8 U	1 U	1 U	1 U
BARIUM	100 J	104 J	59 J	45.1 J	7.3 J	46.3 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	1.9 U	1.9 U	1.9 U
CALCIUM	193000 J	199000 J	126000 J	129000 J	56600 J	176000 J
CHROMIUM	16.8	20.7	13.1	7.4 U	4.5 U	12.5
COBALT	10.7	13	10.8 U	3.9 U	3.9 U	3.9 U
COPPER	6.6	6.3	3 U	3.9 U	5.7	3.9 U
CYANIDE	5 U	5 U	5 U	5 U	5 U	5 U
IRON	5870 J	6610 J	4680 J	2700 J	11000 J	2260 J
LEAD	6.6	7.9	1 U	0.8 UJ	0.8 UJ	0.8 UJ
MAGNESIUM	43200 J	44300 J	20700 J	50200 J	32000 J	33000 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-01	003-TW-DP1-01	003-TW-074-01	003-MS-28D-01	003-MS-28I-01	003-MS-28S-01
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-01				

METALS (µg/L)

MANGANESE	1820 J	1890 J	1010 J	415	251	1240
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	29.4 J	27.6 J	24.8 J	4.3 U	4.3 U	4.3 U
POTASSIUM	4340 J	4410 J	4100 J	2560	4260	2990
SELENIUM	5 UJ	5 UJ	1 UJ	1 UJ	1 UJ	1 UJ
SILVER	3 U	3 U	3 U	3.7 U	3.7 U	3.7 U
SODIUM	16800 J	17100 J	11100 J	14600 J	15100 J	11500 J
THALLIUM	1.2 U	1 U	1.3 U	1.8 U	1.8 U	1.8 U
VANADIUM	9.6 U	9 U	2.2	2.9 U	2.9 U	2.9 U
ZINC	35.8 J	33.7 U	31.7 U	27.7 J	123 J	13.5

MISCELLANEOUS PARAMETERS (mg/L)

TOTAL SUSPENDED SOLIDS				9	25	8
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GENERAL CHEMISTRY

PH				7.33	7.22	6.79
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	0.3 J
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	3.7	0.2 J	1 U	17	1 U
1,1-DICHLOROETHENE	1 U	1.9	1 U	1 U	0.9 J	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1.7	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	1 U	0.3 J	1 U	0.3 J	0.5 J
CIS-1,2-DICHLOROETHENE	2.7	46	54	1.6	5	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	0.3 J	3.8	1 U	5	6.3	1 U
TOLUENE	1 U	1 U	0.4 J	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	0.5 J	0.7 J	6	1 U	1 U	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	1.8	720	18	13	150	3.9
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	0.4	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
2,2'-OXYBIS(1-CHLOROPROPANE)	1 U	1 U	1 U	1 U	1 U	1 U
2,4,5-TRICHLOROPHENOL	20 U	20 U	20 U	20 U	20 U	20 U
2,4,6-TRICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DIMETHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DINITROPHENOL	20 U	20 U	20 U	20 U	20 U	20 U
2,4-DINITROTOLUENE	5 U	5 U	5 U	5 U	5 U	5 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
2-CHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

2-METHYLNAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	20 U	20 U	20 U	20 U	20 U	20 U
2-NITROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
3,3'-DICHLOROBENZIDINE	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U
3-NITROANILINE	20 U	20 U	20 U	20 U	20 U	20 U
4,6-DINITRO-2-METHYLPHENOL	20 U	20 U	20 U	20 U	20 U	20 U
4-BROMOPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLOROANILINE	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLOROPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	5 U
4-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
4-NITROANILINE	20 U	20 U	20 U	20 U	20 U	20 U
4-NITROPHENOL	20 UJ	20 UJ	20 UJ	20 U	20 U	20 U
ACENAPHTHENE	5 U	5 U	5 U	5 U	5 U	5 U
ACENAPHTHYLENE	5 U	5 U	5 U	5 U	5 U	5 U
ANTHRACENE	5 U	5 U	5 U	5 U	5 U	5 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	5 U	5 U	5 U	5 U	5 U	5 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHYL)ETHER	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-ETHYLHEXYL)PHTHALATE	5 U	5 U	5 U	2 U	3 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
CARBAZOLE	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U
CHRYSENE	5 U	5 U	5 U	5 U	5 U	5 U
DI-N-BUTYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	1 U
DI-N-OCTYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	5 U	5 U	5 U	5 U	5 U	5 U
DIETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
DIMETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
FLUORENE	5 U	5 U	5 U	5 U	5 U	5 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	5 U	5 U	5 U	5 U	5 U	5 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	5 U	5 U	5 U	5 U	5 U	5 U
N-NITROSO-DI-N-PROPYLAMINE	5 U	5 U	5 U	5 U	5 U	5 U
N-NITROSODIPHENYLAMINE	5 U	5 U	5 U	5 U	5 U	5 U
NAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
NITROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
PENTACHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U
PHENANTHRENE	5 U	5 U	5 U	5 U	5 U	5 U
PHENOL	5 U	5 U	5 U	5 U	5 U	5 U
PYRENE	5 U	5 U	5 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

PCBs (µg/L)

AROCLOR-1016	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1221	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
AROCLOR-1232	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1242	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1248	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1254	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

METALS (µg/L)

ALUMINUM	36.3	28 U	28 U	28 U	29.6 U	28 U
ANTIMONY	14 U	14 U	14 U	14 U	14 U	14 U
ARSENIC	1 U	1.4	1 U	1 U	1 U	1 U
BARIUM	64.5 J	45.5 J	39.2 J	40.6 J	66.3 J	29.5 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
CALCIUM	120000 J	168000 J	169000 J	202000	159000 J	101000 J
CHROMIUM	6.5	11.9	13.6	16.2	13.4	11.2
COBALT	3.9 U	3.9 U	3.9 U	6.9 U	3.9 U	3.9 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U
CYANIDE	5 U	5 U	5 U	5 U	5 U	5 U
IRON	465 J	6890 J	614 J	2630 J	2830 J	111 U
LEAD	0.8 UJ	0.8 UJ	0.8 UJ	0.8 U	0.8 U	1.3
MAGNESIUM	45300 J	43600 J	42200 J	63800	48000 J	22900 J
MANGANESE	342	641	907	566	829 J	4.7 U
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2	0.21

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-01	003-MS-29I-01	003-MS-29S-01	003-MS-30D-01	003-MS-30I-01	003-MS-30S-01
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

METALS (µg/L)

NICKEL	4.3 U	4.3 U	11.1	4.3 U	4.3 U	4.3 U
POTASSIUM	2600	2890	5130	2860	3140	2280
SELENIUM	1 UJ	1 UJ	1 UJ	1 UJ	2.6 U	9.8 U
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
SODIUM	28300 J	5690 J	25800 J	11600	17100 J	13100 J
THALLIUM	1.8 U	1.8 U	2.2	9 UJ	1.8 U	1.8 U
VANADIUM	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
ZINC	20.3 J	229 J	18.5 J	8.8 U	89.3 J	18.2 U

MISCELLANEOUS PARAMETERS (mg/L)

TOTAL SUSPENDED SOLIDS	2 U	16	3	9	6	2 U
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GENERAL CHEMISTRY

PH	7.26	7.1	6.95	7.37	7.25	7.64
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	0.3 J	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	2.4	1.1	1 U	7.2	1 U
1,1-DICHLOROETHENE	1 U	1 U	1.6	1 U	13	10
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLORO BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	0.6 J	1 U	1 U	1 U	0.4 J	1 U
CIS-1,2-DICHLOROETHENE	1.2	1 U	200	4.1	560	550
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	1 U	1 U	0.2 J	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1 U	0.2 J	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	1 U	1 U	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	1 U	1 U	1 U	1 U
TOLUENE	1 U	1 U	1 U	1 U	0.6 J	0.6 J
TRANS-1,2-DICHLOROETHENE	1 U	1 U	13	1.6	1300	1400
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	0.7 J	1 U	82	3.4	14000	15000
VINYL CHLORIDE	0.3 U	0.3 U	0.3 U	0.3 U	7.8	6.5

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
2,2'-OXYBIS(1-CHLOROPROPANE)	1 U	1 U	1 U	1 U	1 U	1 U
2,4,5-TRICHLOROPHENOL	20 U	20 U	22 U	21 U	20 U	21 U
2,4,6-TRICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DIMETHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
2,4-DINITROPHENOL	20 U	20 U	22 U	21 U	20 U	21 U
2,4-DINITROTOLUENE	5 U	5 U	5 U	5 U	5 U	5 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
2-CHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

SEMIVOLATILES (µg/L)

2-METHYLNAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	20 U	20 U	22 U	21 U	20 U	21 U
2-NITROPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
3,3'-DICHLOROBENZIDINE	5 U	5 U	5 U	5 U	5 U	5 U
3-NITROANILINE	20 U	20 U	22 U	21 U	20 U	21 U
4,6-DINITRO-2-METHYLPHENOL	20 U	20 U	22 U	21 U	20 U	21 U
4-BROMOPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLOROANILINE	5 U	5 U	5 U	5 U	5 U	5 U
4-CHLOROPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	5 U
4-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	5 U
4-NITROANILINE	20 U	20 U	22 U	21 U	20 U	21 U
4-NITROPHENOL	20 U	20 U	22 U	21 U	20 U	21 U
ACENAPHTHENE	5 U	5 U	5 U	5 U	5 U	5 U
ACENAPHTHYLENE	5 U	5 U	5 U	5 U	5 U	5 U
ANTHRACENE	5 U	5 U	5 U	5 U	5 U	5 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	5 U	5 U	5 U	5 U	5 U	5 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHYL)ETHER	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-ETHYLHEXYL)PHTHALATE	1 U	6 U	5 U	2 U	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
CARBAZOLE	5 U	5 U	5 U	5 U	5 U	5 U
CHRYSENE	5 U	5 U	5 U	5 U	5 U	5 U
DI-N-BUTYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
DI-N-OCTYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	5 U	5 U	5 U	5 U	5 U	5 U
DIETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
DIMETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	5 U
FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
FLUORENE	5 U	5 U	5 U	5 U	5 U	5 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	5 U	5 U	5 U	5 U	5 U	5 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	5 U	5 U	5 U	5 U	5 U	5 U
N-NITROSO-DI-N-PROPYLAMINE	5 U	5 U	5 U	5 U	5 U	5 U
N-NITROSODIPHENYLAMINE	5 U	5 U	5 U	5 U	5 U	5 U
NAPHTHALENE	5 U	5 U	5 U	5 U	5 U	5 U
NITROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
PENTACHLOROPHENOL	10 U	10 U	11 U	11 U	10 U	10 U
PHENANTHRENE	5 U	5 U	5 U	5 U	5 U	5 U
PHENOL	5 U	5 U	5 U	5 U	5 U	5 U
PYRENE	5 U	5 U	5 U	5 U	5 U	5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

PCBs (µg/L)

AROCLOR-1016	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1221	0.4 U	0.4 UJ	0.4 U	0.4 U	0.4 U	0.4 U
AROCLOR-1232	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1242	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1248	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1254	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U

METALS (µg/L)

ALUMINUM	36.3 U	28 U	28 U	28 U	28 U	28 U
ANTIMONY	14 U	14 U	14 U	14 U	14 U	14 U
ARSENIC	1 U	2.1	2.7	1 U	8	9.4
BARIUM	53.6 J	31.6 J	87.2 J	59.8 J	88.1 J	89.7 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
CALCIUM	138000 J	375000 J	215000 J	114000	211000	218000
CHROMIUM	12	26.7	15.6	4.5 U	11.7	19.7
COBALT	3.9 U	3.9 U	5.9	3.9 U	3.9 U	3.9 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U
CYANIDE	5 U	5 U	5 U	9	5 U	7
IRON	2830 J	6970 J	2560 J	2060 J	9010 J	9280 J
LEAD	0.8 U	0.8 UJ	0.8 UJ	0.8 U	0.8 U	0.8 U
MAGNESIUM	55300 J	110000 J	57100 J	43000	62000	63400
MANGANESE	331 J	1760	1600	341	850	872
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-01	003-MS-31I-01	003-MS-31S-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-01

METALS (µg/L)

NICKEL	4.3 U	4.3 U	35	4.3 U	4.3 U	4.3 U
POTASSIUM	3200	3860	4790	2290	2630	2710
SELENIUM	1 UJ	5 UJ	1 UJ	1 UJ	5 UJ	5 UJ
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
SODIUM	29400 J	8690 J	12200 J	29000	17700	18000
THALLIUM	1.8 U	1.8 U	1.8 U	45 UJ	1.8 UJ	9 UJ
VANADIUM	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	3.1
ZINC	27.7 U	20.4 J	16.7 J	19.6 U	8.2 U	7.6

MISCELLANEOUS PARAMETERS (mg/L)

TOTAL SUSPENDED SOLIDS	5	12	6	5	20	17
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GENERAL CHEMISTRY

PH	7.41	7.05	6.78	7.41	7.16	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	5	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	1.9	1 U	5.1	1	0.2 J	1 U
1,2-DICHLOROETHANE	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	5 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1 U	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1 U	1 U	1 U	1 U	1 U	1 UJ
CARBON DISULFIDE	1 U	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	0.3 J	0.4 J	1 U	1 U
CHLOROFORM	1 U	1 U	1 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	0.3 J	1.2	1	0.4 J	1 U
CIS-1,2-DICHLOROETHENE	170	2.5	580	570	2.3	1 U
CIS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	0.3 J	0.3 J	1 U	1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	0.7 J	0.6 J	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	2 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	0.3 J	1 J	1 U	1 U
STYRENE	1 U	1 U	1 U	1 U	1 U	1 U
TETRACHLOROETHENE	2.1	22	6.8	6.3	1 U	0.7 J
TOLUENE	1 U	1 U	1.6	1.5	1 U	1 U
TRANS-1,2-DICHLOROETHENE	110	0.3 J	1100	1100	7.2	1 U
TRANS-1,3-DICHLOROPROPENE	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	370	7.5	59000	54000	87	1.6
VINYL CHLORIDE	0.4	0.3 U	9.1	9.5	0.3 U	0.3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	10 U
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	10 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	10 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	10 U
2,2'-OXYBIS(1-CHLOROPROPANE)	1 U	1 U	1 U	1 U	1 U	
2,4,5-TRICHLOROPHENOL	20 U	20 U	20 U	20 U	20 U	25 U
2,4,6-TRICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
2,4-DICHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
2,4-DIMETHYLPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
2,4-DINITROPHENOL	20 U	20 U	20 U	20 U	20 U	25 U
2,4-DINITROTOLUENE	5 U	5 U	5 U	5 U	5 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	5 U	5 U	5 U	5 U	5 U	10 U
2-CHLOROPHENOL	5 U	5 U	5 U	5 U	5 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

SEMIVOLATILES (µg/L)

2-METHYLNAPHTHALENE	5 U	5 U	5 U	5 U	5 U	10 U
2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	20 U	20 U	20 U	20 U	20 U	25 U
2-NITROPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
3,3'-DICHLOROBENZIDINE	5 U	5 U	5 U	5 U	5 U	10 U
3-NITROANILINE	20 U	20 U	20 U	20 U	20 U	25 U
4,6-DINITRO-2-METHYLPHENOL	20 U	20 U	20 U	20 U	20 U	25 U
4-BROMOPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	10 U
4-CHLORO-3-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
4-CHLOROANILINE	5 U	5 U	5 U	5 U	5 U	10 U
4-CHLOROPHENYL PHENYL ETHER	5 U	5 U	5 U	5 U	5 U	10 U
4-METHYLPHENOL	5 U	5 U	5 U	5 U	5 U	10 U
4-NITROANILINE	20 U	20 U	20 U	20 U	20 U	25 U
4-NITROPHENOL	20 U	20 U	20 U	20 U	20 U	25 U
ACENAPHTHENE	5 U	5 U	5 U	5 U	5 U	10 U
ACENAPHTHYLENE	5 U	5 U	5 U	5 U	5 U	10 U
ANTHRACENE	5 U	5 U	5 U	5 U	5 U	10 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	5 U	5 U	5 U	5 U	5 U	10 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	5 U	5 U	5 U	5 U	5 U	10 U
BIS(2-CHLOROETHYL)ETHER	5 U	5 U	5 U	5 U	5 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER						10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

SEMIVOLATILES (µg/L)

BIS(2-ETHYLHEXYL)PHTHALATE	1 U	3 U	2 U	1 U	1 U	1 J
BUTYLBENZYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	10 U
CARBAZOLE	5 U	5 U	5 U	5 U	5 U	10 U
CHRYSENE	5 U	5 U	5 U	5 U	5 U	10 U
DI-N-BUTYL PHTHALATE	5 U	5 U	1 U	5 U	5 U	10 U
DI-N-OCTYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	10 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	5 U	5 U	5 U	5 U	5 U	10 U
DIETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	10 U
DIMETHYL PHTHALATE	5 U	5 U	5 U	5 U	5 U	10 U
FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	10 U
FLUORENE	5 U	5 U	5 U	5 U	5 U	10 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	5 U	5 U	5 U	5 U	5 U	10 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	5 U	5 U	5 U	5 U	5 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	5 U	5 U	5 U	5 U	5 U	10 U
N-NITROSODIPHENYLAMINE	5 U	5 U	5 U	5 U	5 U	10 U
NAPHTHALENE	5 U	5 U	5 U	5 U	5 U	10 U
NITROBENZENE	5 U	5 U	5 U	5 U	5 U	10 U
PENTACHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	25 U
PHENANTHRENE	5 U	5 U	5 U	5 U	5 U	10 U
PHENOL	5 U	5 U	5 U	1 J	5 U	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

SEMIVOLATILES (µg/L)

PYRENE	5 U	5 U	5 U	5 U	5 U	10 U
PYRIDINE						10 U

PCBs (µg/L)

AROCLOR-1016	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U
AROCLOR-1221	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	1 U
AROCLOR-1232	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U
AROCLOR-1242	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U
AROCLOR-1248	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U
AROCLOR-1254	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U
AROCLOR-1260	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U

METALS (µg/L)

ALUMINUM	28 U	37.5 U	567 J	712 J	28 U	207
ANTIMONY	14 U	14 U	14 U	14 U	14 U	19 U
ARSENIC	6 J	1 U	1.1 U	1.6 U	1.3 U	1 U
BARIUM	52.8 J	27.9 J	80.1 J	82.7 J	60.1	30.9
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.4
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	2 U
CALCIUM	200000 J	138000 J	182000 J	189000 J	85500 J	71200
CHROMIUM	9.5	11.3	18.8	16.1	7.2	19.1 J
COBALT	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	2 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3 U
CYANIDE	6.7	6	5 U	8.6	5.9	5 U
IRON	4580 J	2280 J	7940 J	8260 J	767 J	2080 J
LEAD	0.8	1.7	0.8 U	0.8 U	0.8 U	1 U
MAGNESIUM	49900 J	55500 J	66400 J	69000 J	18900 J	14900 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-01	003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01	003-TW-P01-01
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-01		

METALS (µg/L)

MANGANESE	882 J	167 J	655 J	677 J	210 J	71.6 J
MERCURY	0.2 U	0.2 U	0.2 U	0.57	0.2 U	0.2 U
NICKEL	4.3 U	4.3 U	5.2	4.3 U	4.3 U	4 U
POTASSIUM	3800	2980	3850	3840	3220	2010
SELENIUM	1 UJ	1 UJ	1 UJ	1 UJ	12.5 U	4.6 U
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3 U
SODIUM	37900 J	24600 J	127000 J	132000 J	12600 J	5080 J
THALLIUM	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1 U
VANADIUM	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2 U
ZINC	17.7 U	32.5 U	21.2 U	62.1 U	16.6 U	19.3 U

MISCELLANEOUS PARAMETERS (mg/L)

TOTAL SUSPENDED SOLIDS	10	3	35	37	2 U	
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GENERAL CHEMISTRY

PH	6.96	7.36	7.32		7.53	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	0.3 J	1 U	20 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	20 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1 U	1 U	20 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1 U	1 U	8.4 J	1 U	1.2	1.2
1,1-DICHLOROETHENE	1.4	1 U	20 U	1 U	0.7 J	0.7 J
1,2-DICHLOROETHANE	1 U	1 U	20 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1 U	1 U	20 U	1 U	1 U	1 U
2-BUTANONE	5 UR	5 UR	100 UR	5 UR	5 UR	5 UR
2-HEXANONE	5 UR	5 U	100 UR	5 UR	5 UR	5 UR
4-METHYL-2-PENTANONE	5 U	5 U	100 U	5 U	5 U	5 U
ACETONE	5 UR	5 UR	100 UR	5 UR	5 UR	5 UR
BENZENE	1 U	1 U	20 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1 U	1 U	20 U	1 U	1 U	1 U
BROMOFORM	1 UJ	1 U	20 U	1 UJ	1 U	1 U
BROMOMETHANE	1 U	1 U	20 U	1 U	1 UJ	1 UJ
CARBON DISULFIDE	1 U	1 U	20 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1 U	1 U	20 U	1 U	1 U	1 U
CHLOROBENZENE	1 U	1 U	20 U	1 U	1 U	1 U
CHLOROETHANE	1 U	1 U	20 U	1 U	1 U	1 U
CHLOROFORM	1 U	1 U	20 U	1 U	1 U	1 U
CHLOROMETHANE	1 U	0.3 J	20 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	80	3.9	510	1 U	270	260
CIS-1,3-DICHLOROPROPENE	1 UJ	1 U	20 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1 U	1 U	20 U	1 U	1 U	1 U
ETHYLBENZENE	1 U	1 U	820	1 U	1 U	1 U

Blank space Indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	780	1 U	1 U	1 U
METHYLENE CHLORIDE	2 U	2 U	40 U	2 U	2 U	2 U
O-XYLENE	1 U	1 U	750	1 U	1 U	1 U
STYRENE	1 U	1 U	20 U	1 U	1 U	1 U
TETRACHLOROETHENE	1 U	1 U	20 U	1.8	1 U	1 U
TOLUENE	1 U	1 U	34	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	30	1 U	20 U	1 U	11	11
TRANS-1,3-DICHLOROPROPENE	1 UJ	1 U	20 U	1 UJ	1 U	1 U
TRICHLOROETHENE	320	10	20 U	1.2	4.9	4.3
VINYL CHLORIDE	0.3 U	0.3 U	6 U	0.3 U	0.3 U	0.3 J

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	10 U	10 U	11 U	10 U	10 U	11 U
1,2-DICHLOROBENZENE	10 U	10 U	11 U	10 U	10 U	11 U
1,3-DICHLOROBENZENE	10 U	10 U	11 U	10 U	10 U	11 U
1,4-DICHLOROBENZENE	10 U	10 U	11 U	10 U	10 U	11 U
2,4,5-TRICHLOROPHENOL	26 U	26 U	26 U	26 U	25 U	27 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
2,4-DICHLOROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
2,4-DIMETHYLPHENOL	10 U	10 U	3 J	10 U	10 U	11 U
2,4-DINITROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	10 U	10 U	11 U	10 U	10 U	11 U
2-CHLOROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
2-METHYLNAPHTHALENE	10 U	10 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	26 U	26 U	26 U	26 U	25 U	27 U
2-NITROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	11 U	10 U	10 U	11 U
3-NITROANILINE	26 U	26 U	26 U	26 U	25 U	27 U
4,6-DINITRO-2-METHYLPHENOL	26 U	26 U	26 U	26 U	25 U	27 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	11 U	10 U	10 U	11 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
4-CHLOROANILINE	10 U	10 U	11 U	10 U	10 U	11 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	11 U	10 U	10 U	11 U
4-METHYLPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
4-NITROANILINE	26 U	26 UJ	26 U	26 U	25 U	27 U
4-NITROPHENOL	26 U	26 U	26 U	26 U	25 U	27 U
ACENAPHTHENE	10 U	10 U	11 U	10 U	10 U	11 U
ACENAPHTHYLENE	10 U	10 U	11 U	10 U	10 U	11 U
ANTHRACENE	10 U	10 U	11 U	10 U	10 U	11 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	10 U	10 U	11 U	10 U	10 U	11 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	11 U	10 U	10 U	11 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	10 U	10 UJ	11 UJ	10 U	10 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	1 J	1 J	11 U	10 U	10 U	11 U
CARBAZOLE	10 U	10 UJ	11 U	10 U	10 U	11 U
CHRYSENE	10 U	10 U	11 U	10 U	10 U	11 U
DI-N-BUTYL PHTHALATE	1 J	10 U	11 U	10 U	10 U	11 U
DI-N-OCTYL PHTHALATE	10 U	10 U	11 U	10 U	10 U	11 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	10 U	10 U	11 U	10 U	10 U	11 U
DIETHYL PHTHALATE	10 U	10 U	11 U	10 U	10 U	11 U
DIMETHYL PHTHALATE	10 U	10 U	11 U	10 U	10 U	11 U
FLUORANTHENE	10 U	10 U	11 U	10 U	10 U	11 U
FLUORENE	10 U	10 U	11 U	10 U	10 U	11 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	11 U	10 U	10 U	11 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	10 U	10 U	11 U	10 U	10 U	11 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	11 U	10 U	10 U	11 U
N-NITROSODIPHENYLAMINE	10 U	10 U	11 U	10 U	10 U	11 U
NAPHTHALENE	10 U	10 U	11 U	10 U	10 U	11 U
NITROBENZENE	10 U	10 U	11 U	10 U	10 U	11 U
PENTACHLOROPHENOL	10 U	10 U	11 U	10 U	10 U	11 U
PHENANTHRENE	10 U	10 U	11 U	10 U	10 U	11 U
PHENOL	10 U	10 U	11 U	10 U	10 U	11 U
PYRENE	10 U	10 U	11 U	10 U	10 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

SEMIVOLATILES (µg/L)

PYRIDINE	10 U	10 UJ	11 UJ	10 U	10 U	11 U
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PCBs (µg/L)

AROCLOR-1016	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U
AROCLOR-1221	1 U	1 U	1.1 U	1 U	1 U	1 U
AROCLOR-1232	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U
AROCLOR-1242	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U
AROCLOR-1248	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U
AROCLOR-1254	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U
AROCLOR-1260	0.5 U	0.5 U	0.53 U	0.51 U	0.5 U	0.52 U

METALS (µg/L)

ALUMINUM	503 J	404 J	26 U	26 U	18 U	18 U
ANTIMONY	19 U	19 U	16 U	16 U	19 U	19 U
ARSENIC	1 U	1 U	2.1 J	1 U	3.2 U	2.8 U
BARIUM	56.9 J	92.2 J	43.1 J	23 J	115 J	112 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	175000 J	184000 J	140000 J	94100	220000 J	214000 J
CHROMIUM	26.2 U	23.3	6.4	6.6	16.8 U	17.6 U
COBALT	4.8 U	7.6 U	5 U	5 U	3.1 U	2.3 U
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
CYANIDE	5 U	5 U	5 U	5 U	5 UR	5 UR
IRON	8970 J	4460 J	5070 J	1080 J	4350 J	4170 J
LEAD	1 U	1 U	1 U	1 U	1 U	1.2 U
MAGNESIUM	36300 J	40500 J	45400 J	22900	40000 J	38600 J
MANGANESE	488 J	1850	453 J	28 J	2260 J	2190 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-01	003-TW-P03-01	003-TW-P04-01	003-TW-P05-01	003-TW-P06-01	003-TW-DP1-02
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-01

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	11	24.5	5 U	5 U	8.9 U	9.8 U
POTASSIUM	4680	4580	3790	1660	5610 J	5370 J
SELENIUM	9.6 J	1 UJ	1 UJ	52.7 J	1 UJ	1 UJ
SILVER	3 U	3 U	4.2 U	3 U	3 U	3 U
SODIUM	10800 J	16000 J	8750 J	10300 J	16500 J	15900 J
THALLIUM	1 U	1 UJ	1 UJ	1 U	1.1 J	1 U
VANADIUM	3 U	3.6	2 U	2 U	2.3	2 U
ZINC	27.2 J	26.7 J	5.9 U	6.2 U	12.9 U	12.3 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	16	0.4 J	1 U	1000 U	1 U	10 U
1,1,2,2-TETRACHLOROETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
1,1,2-TRICHLOROETHANE	0.5 J	1 U	1 U	1000 U	1 U	10 U
1,1-DICHLOROETHANE	6.2	5.5	22	1000 U	11	8.3 J
1,1-DICHLOROETHENE	5.2	1.4	13	1000 U	19	4.6 J
1,2-DICHLOROETHANE	0.3 J	1 U	1 U	1000 U	1 U	10 U
1,2-DICHLOROPROPANE	1 U	1 U	1 U	1000 U	1 U	10 U
2-BUTANONE	5 UR	5 UR	5 UR	5000 UR	5 UR	50 UR
2-HEXANONE	5 U	5 UR	5 UR	5000 UR	5 UR	50 UR
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5000 U	5 U	50 U
ACETONE	5 UR	5 UR	5 UR	5000 UR	5 UR	50 UR
BENZENE	1 U	1 U	1 U	1000 U	1 U	10 U
BROMODICHLOROMETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
BROMOFORM	1 U	1 U	1 U	1000 U	1 U	10 U
BROMOMETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
CARBON DISULFIDE	1 U	1 U	1 U	1000 U	1 U	10 U
CARBON TETRACHLORIDE	1 U	1 U	1 U	1000 U	1 U	10 U
CHLOROENZENE	1 U	1 U	1 U	1000 U	1 U	10 U
CHLOROETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
CHLOROFORM	1 U	1 U	1 U	1000 U	1 U	10 U
CHLOROMETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
CIS-1,2-DICHLOROETHENE	61	220	99	730 J	760	56
CIS-1,3-DICHLOROPROPENE	1 U	1 UJ	1 U	1000 U	1 UJ	10 U
DIBROMOCHLOROMETHANE	1 U	1 U	1 U	1000 U	1 U	10 U
ETHYLBENZENE	1 U	1 U	1 U	1000 U	0.3 J	10 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

VOLATILES (µg/L)

M+P-XYLENES	1 U	1 U	1 U	1000 U	0.5 J	10 U
METHYLENE CHLORIDE	2 U	2 U	2 U	640 J	5 U	20 U
O-XYLENE	1 U	1 U	1 U	1000 U	0.3 J	10 U
STYRENE	1 U	1 U	1 U	1000 U	1 U	10 U
TETRACHLOROETHENE	1	1 U	6.9	1000 U	1 U	7.8 J
TOLUENE	1 U	1 U	1 U	240 J	0.8 J	10 U
TRANS-1,2-DICHLOROETHENE	77	3	4.1	1900	1800	3.7 J
TRANS-1,3-DICHLOROPROPENE	1 U	1 UJ	1 U	1000 U	1 UJ	10 U
TRICHLOROETHENE	510	100	880	39000	36000	930
VINYL CHLORIDE	0.2 J	0.3 U	40	300 U	16	3 U

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	11 U
1,2-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	11 U
1,3-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	11 U
1,4-DICHLOROBENZENE	10 U	10 U	10 U	10 U	11 U	11 U
2,4,5-TRICHLOROPHENOL	25 U	26 U	26 U	25 U	26 U	27 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
2,4-DINITROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
2,4-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2,6-DINITROTOLUENE	2 U	2 U	2 U	2 U	2 U	2 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U	11 U	11 U
2-CHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U	11 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

SEMIVOLATILES (µg/L)

2-METHYLPHENOL	3 U	3 U	3 U	3 U	3 U	3 U
2-NITROANILINE	25 U	26 U	26 U	25 U	26 U	27 U
2-NITROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
3,3'-DICHLOROBENZIDINE	10 U	10 U	10 U	10 U	11 U	11 U
3-NITROANILINE	25 U	26 U	26 U	25 U	26 U	27 U
4,6-DINITRO-2-METHYLPHENOL	25 U	26 U	26 U	25 U	26 U	27 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	11 U	11 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
4-CHLOROANILINE	10 U	10 U	10 U	10 U	11 U	11 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U	11 U	11 U
4-METHYLPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
4-NITROANILINE	25 U	26 U	26 U	25 U	26 U	27 U
4-NITROPHENOL	25 U	26 U	26 U	25 U	26 U	27 U
ACENAPHTHENE	10 U	10 U	10 U	10 U	11 U	11 U
ACENAPHTHYLENE	10 U	10 U	10 U	10 U	11 U	11 U
ANTHRACENE	10 U	10 U	10 U	10 U	11 U	11 U
BENZO(A)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(A)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(B)FLUORANTHENE	1 U	1 U	1 U	1 U	1 U	1 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U	11 U	11 U
BENZO(K)FLUORANTHENE	5 U	5 U	5 U	5 U	5 U	5 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U	11 U	11 U
BIS(2-CHLOROETHYL)ETHER	1 U	1 U	1 U	1 U	1 U	1 U
BIS(2-CHLOROISOPROPYL) ETHER	10 U	10 U	10 U	10 U	11 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U	10 U	11 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

SEMIVOLATILES (µg/L)

BUTYLBENZYL PHTHALATE	1 J	10 U	10 U	10 U	11 U	11 U
CARBAZOLE	10 UJ	10 U	10 U	10 U	11 U	11 U
CHRYSENE	10 U	10 U	10 U	10 U	11 U	11 U
DI-N-BUTYL PHTHALATE	10 U	1 J	10 U	10 U	11 U	11 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	11 U
DIBENZO(A,H)ANTHRACENE	1 U	1 U	1 U	1 U	1 U	1 U
DIBENZOFURAN	10 U	10 U	10 U	10 U	11 U	11 U
DIETHYL PHTHALATE	10 U	10 U	10 U	10 U	11 U	11 U
DIMETHYL PHTHALATE	10 U	10 U	10 UJ	10 U	11 U	11 U
FLUORANTHENE	10 U	10 U	10 U	10 U	11 U	11 U
FLUORENE	10 U	10 U	10 U	10 U	11 U	11 U
HEXACHLOROBENZENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROBUTADIENE	1 U	1 U	1 U	1 U	1 U	1 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	10 U	11 U	11 U
HEXACHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U
INDENO(1,2,3-CD)PYRENE	1 U	1 U	1 U	1 U	1 U	1 U
ISOPHORONE	10 U	10 U	10 U	10 U	11 U	11 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	10 U	11 U	11 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U	11 U	11 U
NAPHTHALENE	10 U	10 U	10 U	10 U	11 U	11 U
NITROBENZENE	10 U	10 U	10 U	10 U	11 U	11 U
PENTACHLOROPHENOL	10 U	10 U	10 U	10 U	11 U	11 U
PHENANTHRENE	10 U	10 U	10 U	10 U	11 U	11 U
PHENOL	10 U	10 U	10 U	10 U	11 U	11 U
PYRENE	10 U	10 U	10 U	10 U	11 U	11 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

SEMIVOLATILES (µg/L)

PYRIDINE	10 UJ	10 UJ	10 U	10 UJ	11 UJ	11 UJ
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PCBs (µg/L)

AROCLOR-1016	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U
AROCLOR-1221	1 U	1 U	1 U	1 U	1 U	1.1 U
AROCLOR-1232	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U
AROCLOR-1242	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U
AROCLOR-1248	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U
AROCLOR-1254	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U
AROCLOR-1260	0.5 U	0.52 U	0.51 U	0.51 U	0.52 U	0.53 U

METALS (µg/L)

ALUMINUM	664 J	650 J	108 U	108 U	57 U	26 U
ANTIMONY	19 U	16 U	19 U	16 U	16 U	16 U
ARSENIC	2.2 U	1.8	1 U	7.4	6.8	5.8
BARIUM	31.7 J	51.4 J	73.3 J	67 J	67.3 J	70.1 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	123000 J	188000 J	178000 J	141000 J	142000 J	128000 J
CHROMIUM	9.6	31	13.5	8.5	6.9	12.4
COBALT	4 U	9.9	2.3 U	5 U	5 U	5 U
COPPER	4.4	3.4	3 U	3 U	3 U	5.9 U
CYANIDE	5 U	5 U	5 U	17	17.5	5 U
IRON	3290 J	10200 J	2340 U	7150 J	7120 J	1390 J
LEAD	1 U	1 U	1 UJ	1.2	1 U	1 U
MAGNESIUM	30400 J	45100 J	32300 J	38600 J	39300 J	58200 J
MANGANESE	1540	2160 J	532 J	659 J	662 J	2770 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-01	003-TW-P08-01	003-TW-P09-01	003-TW-P10-01	003-TW-DP1-04	003-TW-P11-01
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/12/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-01	

METALS (µg/L)

MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	8.7	29.7	6.4	5 U	5 U	9.7
POTASSIUM	3990	4610	3570 J	2710	2730	3690
SELENIUM	27.7 J	1 UJ	20.8 J	1 UJ	1 UJ	5 UR
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	12200 J	11600 J	54900	18800 J	19100 J	13500 J
THALLIUM	1 U	1 U	2.4 U	1 UJ	1 UJ	1 U
VANADIUM	4.5	2 U	2.8 U	2 U	2 U	2 U
ZINC	25 J	63.8 J	9.7 U	4.3 U	9.8 U	6.3 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

VOLATILES (µg/L)

1,1,1-TRICHLOROETHANE	0.6 J	1000 U	9	100 U	9	
1,1,2,2-TETRACHLOROETHANE	1 U	1000 U	10 U	100 U	10 U	
1,1,2-TRICHLOROETHANE	1 U	1000 U	10 U	100 U	10 U	
1,1-DICHLOROETHANE	1.8	1000 U	22	16	9	
1,1-DICHLOROETHENE	1.4	1000 U	10 U	100 U	10 U	
1,2-DICHLOROETHANE	1 U	1000 U	10 U	100 U	10 U	
1,2-DICHLOROETHENE (TOTAL)		12000	180	160	100	
1,2-DICHLOROPROPANE	1 U	1000 U	10 U	100 U	10 U	
2-BUTANONE	5 UR	1000 U	10 U	270	10 U	
2-HEXANONE	5 UR	1000 U	10 U	100 U	10 U	
4-METHYL-2-PENTANONE	5 U	1000 U	10 U	100 U	10 U	
ACETONE	5 UR	1000 U	17 U	100 U	10 U	
BENZENE	1 U	1000 U	10 U	100 U	10 U	
BROMODICHLOROMETHANE	1 U	1000 U	10 U	100 U	10 U	
BROMOFORM	1 U	1000 U	10 U	100 U	10 U	
BROMOMETHANE	1 UJ	1000 U	10 U	100 U	10 U	
CARBON DISULFIDE	1 U	1000 U	10 U	31	10 U	
CARBON TETRACHLORIDE	1 U	1000 U	10 U	100 U	10 U	
CHLOROBENZENE	1 U	1000 U	10 U	100 U	10 U	
CHLOROETHANE	1 U	1000 U	10 U	100 U	10 U	
CHLOROFORM	1 U	1000 U	10 U	100 U	10 U	
CHLOROMETHANE	1 U	1000 U	10 U	100 U	10 U	
CIS-1,2-DICHLOROETHENE	4.8					
CIS-1,3-DICHLOROPROPENE	1 U	1000 U	10 U	100 U	10 U	
DIBROMOCHLOROMETHANE	1 U	1000 U	10 U	100 U	10 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

VOLATILES (µg/L)

ETHYLBENZENE	1 U	1000 U	10 U	100 U	10 U	
M+P-XYLENES	1 U					
METHYLENE CHLORIDE	2 U	1000 U	10 U	100 U	10 U	
O-XYLENE	1 U					
STYRENE	1 U	1000 U	10 U	100 U	10 U	
TETRACHLOROETHENE	3.8	160	5	100 U	10 U	
TOLUENE	1 U	1000 U	10 U	100 U	10 U	
TRANS-1,2-DICHLOROETHENE	0.5 J					
TRANS-1,3-DICHLOROPROPENE	1 U	1000 U	10 U	100 U	10 U	
TRICHLOROETHENE	210	140000	1200	1200	1700	
VINYL CHLORIDE	0.3 U	1000 U	10 U	100 U	10 U	
XYLENES, TOTAL		1000 U	10 U	100 U	10 U	

SEMIVOLATILES (µg/L)

1,2,4-TRICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	
1,2-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	
1,3-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	
1,4-DICHLOROBENZENE	11 U	10 U	10 U	10 U	10 U	
2,2'-OXYBIS(1-CHLOROPROPANE)		10 U	10 U	10 U	10 U	
2,4,5-TRICHLOROPHENOL	27 U	25 U	25 U	25 U	25 U	
2,4,6-TRICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	
2,4-DICHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	
2,4-DIMETHYLPHENOL	11 U	5	10 U	10 U	10 U	
2,4-DINITROPHENOL	11 U	25 U	25 U	25 U	25 U	
2,4-DINITROTOLUENE	2 U	10 U	10 U	10 U	10 U	
2,6-DINITROTOLUENE	2 U	10 U	10 U	10 U	10 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

SEMIVOLATILES (µg/L)

2-CHLORONAPHTHALENE	11 U	10 U	10 U	10 U	10 U	
2-CHLOROPHENOL	11 U	10 U	10 U	10 U	10 U	
2-METHYLNAPHTHALENE	11 U	10 U	10 U	10 U	10 U	
2-METHYLPHENOL	3 U	2	10 U	10 U	10 U	
2-NITROANILINE	27 U	25 U	25 U	25 U	25 U	
2-NITROPHENOL	11 U	10 U	10 U	10 U	10 U	
3,3'-DICHLOROBENZIDINE	11 U	10 U	10 U	10 U	10 U	
3-NITROANILINE	27 U	25 U	25 U	25 U	25 U	
4,6-DINITRO-2-METHYLPHENOL	27 U	25 U	25 U	25 U	25 U	
4-BROMOPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	
4-CHLORO-3-METHYLPHENOL	11 U	10 U	10 U	10 U	10 U	
4-CHLOROANILINE	11 U	10 U	10 U	10 U	10 U	
4-CHLOROPHENYL PHENYL ETHER	11 U	10 U	10 U	10 U	10 U	
4-METHYLPHENOL	11 U	11	10 U	10 U	10 U	
4-NITROANILINE	27 U	25 U	25 U	25 U	25 U	
4-NITROPHENOL	27 U	25 U	25 U	25 U	25 U	
ACENAPHTHENE	11 U	10 U	10 U	10 U	10 U	
ACENAPHTHYLENE	11 U	10 U	10 U	10 U	10 U	
ANTHRACENE	11 U	10 U	10 U	10 U	10 U	
BENZO(A)ANTHRACENE	1 U	10 U	10 U	10 U	10 U	
BENZO(A)PYRENE	1 U	10 U	10 U	10 U	10 U	
BENZO(B)FLUORANTHENE	1 U	10 U	10 U	10 U	10 U	
BENZO(G,H,I)PERYLENE	11 U	10 U	10 U	10 U	10 U	
BENZO(K)FLUORANTHENE	5 U	10 U	10 U	10 U	10 U	
BIS(2-CHLOROETHOXY)METHANE	11 U	10 U	10 U	10 U	10 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

SEMIVOLATILES (µg/L)

BIS(2-CHLOROETHYL)ETHER	1 U	10 U	10 U	10 U	10 U	
BIS(2-CHLOROISOPROPYL) ETHER	11 U					
BIS(2-ETHYLHEXYL)PHTHALATE	1 J	10 U	10 U	10 U	10 U	
BUTYLBENZYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	
CARBAZOLE	11 U	10 U	10 U	10 U	10 U	
CHRYSENE	11 U	10 U	10 U	10 U	10 U	
DI-N-BUTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	
DI-N-OCTYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	
DIBENZO(A,H)ANTHRACENE	1 U	10 U	10 U	10 U	10 U	
DIBENZOFURAN	11 U	10 U	10 U	10 U	10 U	
DIETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	
DIMETHYL PHTHALATE	11 U	10 U	10 U	10 U	10 U	
FLUORANTHENE	11 U	10 U	10 U	10 U	10 U	
FLUORENE	11 U	10 U	10 U	10 U	10 U	
HEXACHLOROBENZENE	1 U	10 U	10 U	10 U	10 U	
HEXACHLOROBUTADIENE	1 U	10 U	10 U	10 U	10 U	
HEXACHLOROCYCLOPENTADIENE	11 U	10 U	10 U	10 U	10 U	
HEXACHLOROETHANE	2 U	10 U	10 U	10 U	10 U	
INDENO(1,2,3-CD)PYRENE	1 U	10 U	10 U	10 U	10 U	
ISOPHORONE	11 U	10 U	10 U	10 U	10 U	
N-NITROSO-DI-N-PROPYLAMINE	11 U	10 U	10 U	10 U	10 U	
N-NITROSODIPHENYLAMINE	11 U	10 U	10 U	10 U	10 U	
NAPHTHALENE	11 U	10 U	10 U	10 U	10 U	
NITROBENZENE	11 U	10 U	10 U	10 U	10 U	
PENTACHLOROPHENOL	11 U	25 U	25 U	25 U	25 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

SEMIVOLATILES (µg/L)

PHENANTHRENE	11 U	10 U	10 U	10 U	10 U	
PHENOL	11 U	10	10 U	10 U	10 U	
PYRENE	11 U	10 U	10 U	10 U	10 U	
PYRIDINE	11 U					

PCBs (µg/L)

AROCLOR-1016	0.52 U	1 U	1 U	1 U		
AROCLOR-1221	1 U	2 U	2 U	2 U		
AROCLOR-1232	0.52 U	1 U	1 U	1 U		
AROCLOR-1242	0.52 U	1 U	1 U	1 U		
AROCLOR-1248	0.52 U	1 U	1 U	1 U		
AROCLOR-1254	0.52 U	1 U	1 U	1 U		
AROCLOR-1260	0.52 U	1 U	1 U	1 U		

METALS (µg/L)

ALUMINUM	25.3	19400	8500	6280	8450	
ANTIMONY	19 U	50 U	50 U	50 U	50 U	
ARSENIC	10.1 J	11	4.2	3.8	3.9	
BARIUM	138	380	154	142	137	
BERYLLIUM	0.3	1 U	1 U	1 U	1 U	
CADMIUM	2 U	3.7 U	3 U	3 U	5.6 U	
CALCIUM	162000	132000	215000	187000	144000	
CHROMIUM	12.8 U	286	24.4 U	25.1 U	28.9 U	
COBALT	2 U	23.8	12.2	10.6	12.7	
COPPER	3 U	172	28.7 U	24.9 U	43.1 J	
CYANIDE	5 U	291	10 U	10 U	10 U	
IRON	18100 J	27000	14100	10400	15300	

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR UNFILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-01	GW-01	GW-02	DUP-03	GW-03	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02		

METALS (µg/L)

LEAD	1 U	10	2.3	2.3	5.1 J	
MAGNESIUM	34000 J	47900	65700	57000	42100	
MANGANESE	475 J	993	1520	1250	862	
MERCURY	0.2 U	0.14 U	0.14 U	0.13 U	0.1 U	
NICKEL	4 U	63.6 U	24.9 U	24.3 U	38.9 U	
POTASSIUM	3540	9430	6610	5470	6430	
SELENIUM	5 UR	4 U	4 U	4 U	33.3	
SILVER	3 U	5 U	5 U	5 U	5 U	
SODIUM	13100 J	89100	10100	8950	9960	
THALLIUM	1 U	5 U	5 U	5 U	5 U	
VANADIUM	2 U	53.9	30.4	22.6	33.7	
ZINC	9.6 U	159	36.8 U	26.1 U	31.8 U	

GENERAL CHEMISTRY

PH		7.53	6.95	6.95	7.34	
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Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-003-F1	003-TW-004-F1	003-TW-006-F1	003-TW-007-F1	003-TW-008-F1	003-TW-013-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/14/97	07/22/97	07/09/97	08/21/97	07/21/97	07/15/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC03	AOC04	AOC06	AOC07	AOC08/AOC09	AOC13/AOC14
FIELD DUPLICATE OF:						

METALS (µg/L)

ALUMINUM	18 U	18 U	18 U	18 U	18 U	18 U
ANTIMONY	19 U	19 UJ	19 U	19 U	19 U	19 U
ARSENIC	1.5 U	1 U	1 U	1 U	1 U	2.1 U
BARIUM	53.8 J	35.4 J	91.5 J	11.9 U	39.8 J	35.7 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	169000 J	265000 J	130000 J	156000 J	106000 J	135000 J
CHROMIUM	10.3	13.4	6 U	10	6.3	10.2
COBALT	2 U	5.7 U	7.1 U	4.5 U	2 U	7.1 U
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
IRON	5070 J	5160 J	12300 J	1070 J	1110 J	1750 J
LEAD	1 UJ	1 U	1 UJ	1 UJ	1 U	1 UJ
MAGNESIUM	42800 J	81200 J	26000 J	29200 J	25600 J	22100 J
MANGANESE	675 J	1090 J	1520 J	807 J	117 J	1300 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	6.4	8.8 J	30.9	12.3	4 U	8
POTASSIUM	2800	5930	4920	2850 J	2580	3950
SELENIUM	1 UJ	1 UJ	1 UJ	1 UJ	47 J	5 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	7850 J	13800 J	22800 J	9100	11100 J	8630 J
THALLIUM	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 U
VANADIUM	2 U	2.3 U	2 U	2 U	2.5 U	2 J
ZINC	18.6 U	24.9 U	43.9 J	7.5 U	23.3 U	7.5 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-015-F1	003-TW-016-F1	003-TW-017-F1	003-TW-018-F1	003-TW-023-F1	003-TW-026-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/22/97	07/26/97	07/25/97	07/26/97	08/09/97	09/20/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC15	AOC16	AOC17	AOC18	AOC23	AOC26
FIELD DUPLICATE OF:						

METALS (µg/L)

ALUMINUM	26 U	18 U	18 U	18 U	18 U	26 U
ANTIMONY	16 U	19 U	19 U	19 U	19 U	16 U
ARSENIC	1 U	1 U	1 U	1 U	1 U	3.5
BARIUM	14.7	55.7 J	78.6 J	55.2 J	56	59.1 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.4	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	74400	196000 J	193000 J	171000 J	107000	148000
CHROMIUM	6 U	13	12	10.2	11.6 U	6 U
COBALT	5 U	7	7.2	9	2 U	5 U
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
IRON	1350 J	2690 J	4270 J	3070 J	1560 J	13400 J
LEAD	1 U	1 U	1.1	1 U	1 U	1 U
MAGNESIUM	18100	42600 J	31600 J	37700 J	25700 J	43900
MANGANESE	131 J	1080 J	1610 J	2920 J	739 J	872 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	5 U	33.7 J	20.6 U	24.6	4 U	5 U
POTASSIUM	2480	4590	4400	4370	3350	4080
SELENIUM	49 J	1 UJ	1 UJ	1 U	21 J	1 UJ
SILVER	3 U	3 U	3 U	3 UJ	3 U	3 U
SODIUM	9550 J	9350 J	11800 J	6240 J	7710 J	13400 J
THALLIUM	1 UJ	1 U	1 U	1 U	1 UJ	1 U
VANADIUM	2 U	2.2 U	2 U	2 U	2 U	2 U
ZINC	7.7 U	20.4 U	12.9 U	18.4 U	6.1 U	10.7 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-027-F1	003-TW-028-F1	003-TW-029-F1	003-TW-030-F1	003-TW-DP1-F3	003-TW-032-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/22/97	09/16/97	09/15/97	08/23/97	08/23/97	08/26/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC27	AOC28	AOC29	AOC30	AOC30	AOC32
FIELD DUPLICATE OF:					003-TW-030-F1	

METALS (µg/L)

ALUMINUM	18 U	26 U	26 U	18 U	18 U	18 U
ANTIMONY	19 U	16 U	16 U	19 U	19 U	19 U
ARSENIC	1 U	1.7 J	1 U	1 U	1 U	1 U
BARIUM	43 J	35.8 J	56.6 J	27.9 J	28.8 J	35 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	78700 J	112000 J	68300 J	52000 J	51600 J	137000 J
CHROMIUM	7.2	11.8	8.1	7.2	7.2	13.8
COBALT	2 U	5 U	5 U	2 U	2 U	13.8 U
COPPER	3 U	5.2 U	6.7 U	3 U	3 U	3 U
IRON	1320 J	2080 J	448 J	528 J	524 J	1950 J
LEAD	1 UJ	1 U	1 U	1 UJ	1 U	1 U
MAGNESIUM	16400 J	25800 J	15700 J	10700 J	10700 J	25000 J
MANGANESE	53.8 J	751 J	31.6 J	20.4 J	23 J	1520 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	4 U	5 U	5 U	4 U	4 U	14.6
POTASSIUM	2620 J	2910	3140	2280 J	2230 J	3670 J
SELENIUM	31 J	1 UR	15.8 J	22.5 J	14.7 J	1 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	10500	7760 J	44100 J	38300	39800	18800
THALLIUM	1.9 J	1.8 U	2.6 U	1.4 J	1 UJ	1 UJ
VANADIUM	2 U	2.7 U	2 U	2 U	2 U	2 U
ZINC	8 U	4.5 U	4.1 U	7.3 U	9 U	6.1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-033-F1	003-TW-034-F1	003-TW-035-F1	003-TW-036-F1	003-TW-037-F1	003-TW-038-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/08/97	07/29/97	07/28/97	08/12/97	08/06/97	07/23/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC33	AOC34	AOC35	AOC36	AOC37	AOC38
FIELD DUPLICATE OF:						

METALS (µg/L)

ALUMINUM	26 U	18 U	18 U	18 U	18 U	18 U
ANTIMONY	16 U	19 U	19 U	19 U	19 U	19 U
ARSENIC	1 U	22.9 J	1 U	2.9	1 U	1 U
BARIUM	55.4 J	127 J	65.6 J	32.4	112	85.2 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.3
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	87100 J	163000 J	81600 J	48100	216000	180000 J
CHROMIUM	13.2	12.6	6.3	6 U	19 U	10.1
COBALT	5 U	2 U	2 U	5.3	4.5	13.1 J
COPPER	3.2 U	3 U	3 U	3 U	3 U	3 U
IRON	846 J	1850 J	753 J	391 J	3940 J	4610 J
LEAD	1 U	1 U	1 U	1 U	1 U	1 U
MAGNESIUM	20900 J	37000 J	15100 J	10100 J	39200 J	48800 J
MANGANESE	26.6 J	25.8 J	26.1 J	76.1 J	2200 J	1490 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	5 U	4 U	4 U	4.1	6.3	9.1
POTASSIUM	4270	3930 J	3750 J	4940	5350	3740
SELENIUM	67.4 J	49.9 J	16.1 J	131 J	116 J	5 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	34800 J	28900 J	43500 J	109000 J	16100 J	11600 J
THALLIUM	1.8 U	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
VANADIUM	2 U	2.4	2 U	3.1	2.5	3.4 U
ZINC	4 U	9.8 U	6.8 U	8 U	8.9 U	21.7 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-039-F1	003-TW-046-F1	003-TW-047-F1	003-TW-DP1-F5	003-TW-050-F1	003-TW-054-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	09/25/97	09/19/97	09/23/97	09/23/97	09/24/97	08/04/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC39	AOC46	AOC47	AOC47	AOC50	AOC54
FIELD DUPLICATE OF:				003-TW-047-F1		

METALS (µg/L)

ALUMINUM	26 U	26 U	26 U	26 U	26 U	18 U
ANTIMONY	16 U	16 U	16 U	16 U	16 U	19 U
ARSENIC	1 J	1 U	1 U	1 U	1 U	1 U
BARIUM	36.6 J	44.4 J	113	110	56 J	96.1 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	175000 J	63600	202000	201000	190000 J	149000 J
CHROMIUM	11.6	6 U	13.4	13.1	8.8	9.9
COBALT	6.5	5 U	5 U	5 U	5 U	2 U
COPPER	3.3	3 U	3 U	3 U	3 U	3 U
IRON	987 J	391 J	1840 J	1850 J	2560 J	2090 J
LEAD	1 U	1 U	1 U	1 U	1 UJ	1 U
MAGNESIUM	49600 J	15200	50100	48500	34300 J	29600 J
MANGANESE	851	188 J	678 J	678 J	920	152 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	13.8	5 U	8.4 U	11.7 U	5 U	4.5
POTASSIUM	4620	3690	3640	3650	3980	4120 J
SELENIUM	1 UJ	31 J	1 UJ	1 UJ	1 UJ	5 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	11300 J	53500 J	110000 J	105000 J	15300 J	38800 J
THALLIUM	1 UJ	1 U	1 UJ	1 UJ	1 UJ	1 UJ
VANADIUM	2 U	2 U	2 U	2 U	2.2 U	2 U
ZINC	11.6 U	9.3 U	10.1 U	9.2 U	14.5 U	14.1 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-055-F1	003-TW-058-F1	003-TW-063-F1	003-TW-068-F1	003-TW-070-F1	003-TW-071-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/24/97	08/20/97	08/05/97	09/21/97	09/04/97	09/18/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC55	AOC58	AOC63	AOC68	AOC70	AOC71
FIELD DUPLICATE OF:						

METALS (µg/L)

ALUMINUM	18 U	18 U	18 U	26 U	26 U	26 U
ANTIMONY	19 U	19 U	19 U	16 U	16 U	16 U
ARSENIC	1 U	1 U	1 U	2.5	1 U	1 U
BARIUM	110 J	24.9 J	35	63.9 J	84.3 J	66.1 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2.2 U	2 U	2 U	2 U
CALCIUM	139000 J	77000 J	112000	204000	226000 J	134000
CHROMIUM	11.1	10.5 U	15.7 U	10.7	12.1	6.2
COBALT	2.1 U	2 U	2.4	5 U	6.6	5 U
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
IRON	1760 J	844 J	1300 J	2180 J	4570 J	1870 J
LEAD	1 U	1 U	1 U	1 U	1 U	1 U
MAGNESIUM	23200 J	20400 J	23600 J	48800	46100 J	34900
MANGANESE	284 J	532 J	62.4 J	369 J	1440 J	1000 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	8.6	4 U	4 U	5 U	10.2	5 U
POTASSIUM	4590 J	3480	2150	2410	3580	2860
SELENIUM	78.8 J	78.4	22.8 J	1 UJ	1 UJ	1 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	50100	19800 J	13800 J	52100 J	9300 J	8030 J
THALLIUM	3.6 U	1 U	1 U	1 UJ	1 UJ	1 U
VANADIUM	2 U	2 U	2.5	2 U	2 U	2 U
ZINC	8.7 U	7 U	6.1 U	12.6 U	8.8 U	10.5 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-073-F1	003-TW-DP1-F1	003-TW-074-F1	003-MS-28D-F1	003-MS-28I-F1	003-MS-28S-F1
DEPTH:	Shallow	Shallow	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	07/24/97	07/24/97	07/27/97	02/17/98	02/11/98	02/11/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	AOC73	AOC73	AOC74	MS-28D	MS-28I	MS-28S
FIELD DUPLICATE OF:		003-TW-073-F1				

METALS (µg/L)

ALUMINUM	18 U	18 U	18 U	28 U	28 U	28 U
ANTIMONY	19 U	19 U	19 U	14 U	14 U	14 U
ARSENIC	1.4	1 U	1 U	1 U	1 U	1 U
BARIUM	87.7 J	88.9 J	56.4 J	43.6 J	4.7 U	47.7 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	1.9 U	1.9 U	1.9 U
CALCIUM	185000 J	186000 J	124000 J	128000 J	48300 J	179000 J
CHROMIUM	13.1	13.8	6.3	10.8	4.5 U	12.1
COBALT	8.2	8.5	6.2	3.9 U	3.9 U	3.9 U
COPPER	3 U	3 U	3 U	3.9 U	3.9 U	3.9 U
IRON	3610 J	2770 J	1640 J	1290 J	4690 J	2280 J
LEAD	1.2	1 U	1 U	0.8 UJ	0.8 UJ	0.8 UJ
MAGNESIUM	40200 J	40300 J	20000 J	49400 J	30600 J	33900 J
MANGANESE	1590 J	1550 J	927 J	407	212	1280
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.44	0.2 U
NICKEL	23.8 J	22.1 U	19.1	4.3 U	4.3 U	4.6
POTASSIUM	4250	4260	4080 J	2510	4280	2990
SELENIUM	1 UJ	1 UJ	1.3 U	1 UJ	1 UJ	1 UJ
SILVER	3 U	3 U	3 U	3.7 U	3.7 U	3.7 U
SODIUM	17300 J	17400 J	11200 J	14500 J	14900 J	11900 J
THALLIUM	1 U	1 U	1 UJ	1.8 U	1.8 U	1.8 U
VANADIUM	2.5 U	2.3 U	2 U	2.9 U	2.9 U	2.9 U
ZINC	24.8 U	24.6 U	8.8 U	13.8 U	28.7 J	16.8 J

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-29D-F1	003-MS-29I-F1	003-MS-29S-F1	003-MS-30D-F1	003-MS-30I-F1	003-MS-30S-F1
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow
SAMPLE DATE:	02/16/98	02/16/98	02/16/98	03/03/98	02/24/98	02/24/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-29D	MS-29I	MS-29S	MS-30D	MS-30I	MS-30S
FIELD DUPLICATE OF:						

METALS (µg/L)

ALUMINUM	28 U	28 U	28 U	28 U	28 U	28 U
ANTIMONY	14 U	14 U	14 U	14 U	14 U	14 U
ARSENIC	1 U	1.1	1 U	1 U	1 U	1 U
BARIUM	63.9 J	45.4 J	37.9 J	42.4 J	64.2 J	28.9 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
CALCIUM	118000 J	171000 J	166000 J	210000	156000 J	98600 J
CHROMIUM	9.1	17.7	11.4	18.2	9.4	11.8
COBALT	3.9 U	3.9 U	3.9 U	7.6 U	3.9 U	3.9 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	4.1
IRON	171 J	5030 J	575 J	2510 J	1380 J	56.7 U
LEAD	0.8 UJ	0.8 UJ	0.8 UJ	0.8 U	0.8 U	0.8 U
MAGNESIUM	45400 J	44900 J	41600 J	66300	47300 J	22500
MANGANESE	339	648	892	588	814 J	3.8
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	4.3 U	4.3 U	11.2	4.3 U	4.3 U	4.3 U
POTASSIUM	2580	2860	5100	2990	3010	2320
SELENIUM	1 UJ	1 UJ	1 UJ	5 UJ	1 UJ	5.7 U
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
SODIUM	28200 J	5790 J	25500 J	12100	16900 J	12900 J
THALLIUM	1.8 U	1.8 U	1.8 U	9 UJ	1.8 U	1.8 U
VANADIUM	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
ZINC	17.7 J	87.8 J	16.4 J	5.4 U	13.3 U	22.8 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-31D-F1	003-MS-31I-F1	003-MS-31S-F1	003-MS-32D-F1	003-MS-32I-F1	003-MS-DP2-F2
DEPTH:	Deep	Intermediate	Shallow	Deep	Intermediate	Intermediate
SAMPLE DATE:	02/26/98	02/18/98	02/17/98	03/02/98	03/02/98	03/02/98
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-31D	MS-31I	MS-31S	MS-32D	MS-32I	MS-32I
FIELD DUPLICATE OF:						003-MS-32I-F1

METALS (µg/L)

ALUMINUM	28 U	28 U	28 U	28 U	28 U	28 U
ANTIMONY	14 U	14 U	14 U	14 U	14 U	14 U
ARSENIC	1 U	3	2.6	1 U	8.6	8.9
BARIUM	52.3 J	30.3 J	86.5 J	59.7 J	87 J	90 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
CALCIUM	136000 J	371000 J	214000 J	117000	212000	219000
CHROMIUM	8.1	22	20.1	6.8	15.2	16.3
COBALT	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U
IRON	1520 J	5770 J	2410 J	763 J	8700 J	8990 J
LEAD	0.8 U	0.8 UJ	0.8 UJ	0.8 U	0.8 U	0.8 U
MAGNESIUM	54700 J	109000 J	56800 J	43900	61500	63700
MANGANESE	317 J	1740	1580	345	849	878
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	4.3 U	4.3 U	32.2	4.3 U	4.3 U	4.3 U
POTASSIUM	3130	3790	4810	2310	2620	2780
SELENIUM	1 UJ	5 UJ	1 UJ	1 UJ	5.1 J	5 UJ
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
SODIUM	29100 J	8600 J	12200 J	29600	17400	18000
THALLIUM	1.8 U	1.8 U	1.8 U	45 UJ	1.8 UJ	9 UJ
VANADIUM	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
ZINC	15.6 U	13.5 U	21.4 J	5.4 U	4.9 U	4.4 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-MS-32S-F1	003-MS-33D-F1	003-MS-33I-F1	003-MS-DP2-F1	003-MS-33S-F1	003-TW-P01-F1
DEPTH:	Shallow	Deep	Intermediate	Intermediate	Shallow	Shallow
SAMPLE DATE:	02/27/98	02/26/98	02/25/98	02/25/98	02/25/98	08/08/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	MS-32S	MS-33D	MS-33I	MS-33I	MS-33S	P01
FIELD DUPLICATE OF:				003-MS-33I-F1		

METALS (µg/L)

ALUMINUM	28 U	28 U	28 U	28 U	48 U	18 U
ANTIMONY	14 U	14 U	14 U	14 U	14 U	19 U
ARSENIC	6.5 J	1 U	1.3 U	1 U	1 U	1 U
BARIUM	54.4 J	26.8 J	77.3	77.3	61.5	29.8
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.3 U
CADMIUM	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	2 U
CALCIUM	206000 J	135000 J	185000 J	185000 J	88300 J	74400
CHROMIUM	15.3	9.7	19.3	9.7	5.9	11.8 U
COBALT	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	2 U
COPPER	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3 U
IRON	4660 J	818 J	6230 J	6220 J	757 J	721 J
LEAD	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	1 U
MAGNESIUM	51000 J	54900 J	67300 J	67900 J	19600 J	15700 J
MANGANESE	906 J	157 J	643 J	643 J	218 J	69 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2	0.2 U	0.2 U
NICKEL	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4 U
POTASSIUM	3950	3050	3730	3580	3400	2170
SELENIUM	1.3 U	2.3 U	1 UJ	5 UJ	11.8 U	6.3 U
SILVER	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3 U
SODIUM	39200 J	24300 J	128000 J	129000 J	13100 J	5460 J
THALLIUM	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1 U
VANADIUM	2.9 U	2.9 U	3.4	2.9 U	2.9 U	2 U
ZINC	18.8 U	19.1 U	15.9 U	17.3 U	17.7 U	7.2 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P02-F1	003-TW-P03-F1	003-TW-P04-F1	003-TW-P05-F1	003-TW-P06-F1	003-TW-DP1-F2
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	08/19/97	07/12/97	09/06/97	09/17/97	08/07/97	08/07/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P02	P03	P04	P05	P06	P06
FIELD DUPLICATE OF:						003-TW-P06-F1

METALS (µg/L)

ALUMINUM	18 U	18 U	26 U	26 U	18 U	18 U
ANTIMONY	19 U	19 U	16 U	16 U	19 U	19 U
ARSENIC	1 U	1.5 J	1.6	1 U	4.1	4.3
BARIUM	51.8 J	84.1	42.5 J	23.5 J	117	108
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	174000 J	172000 J	145000 J	97000	221000	192000
CHROMIUM	14.4 U	12.9	7.5	8	17 U	22.4 U
COBALT	2.2	5.7 U	5 U	5 U	5.4	2.4
COPPER	3 U	3 U	3 U	3 U	3 U	3 U
IRON	2950 J	3060 J	4380 J	1070 J	4070 J	2030 J
LEAD	1 U	1 UJ	1 U	1 U	1 U	1 U
MAGNESIUM	36400 J	37300 J	47000 J	23600	40600 J	40200 J
MANGANESE	443 J	1630 J	449 J	27.3 J	2270 J	194 J
MERCURY	0.2 U	0.36 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	5.8	20.5	5 U	5 U	4.8	4 U
POTASSIUM	4570	4370	3940	1700	5630	3910
SELENIUM	10.3	5 UJ	1 UJ	53.9 J	1 UJ	1 UJ
SILVER	3 U	3 U	3 U	3 U	3 U	3 U
SODIUM	10900 J	15600 J	9010 J	10600 J	16800 J	14300 J
THALLIUM	1.5 U	1 UJ	1 U	1 U	1	1 UJ
VANADIUM	2 U	3.2 U	2 U	2 U	2 U	4
ZINC	4.8 U	16.7 U	5.7 U	7.1 U	8.7 U	7.4 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P07-F1	003-TW-P08-F1	003-TW-P09-F1	003-TW-P10-F1	003-TW-DP1-F4	003-TW-P11-F1
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SAMPLE DATE:	07/11/97	09/03/97	08/24/97	09/05/97	09/05/97	09/09/97
INVESTIGATION:	OU3	OU3	OU3	OU3	OU3	OU3
LOCATION:	P07	P08	P09	P10	P10	P11
FIELD DUPLICATE OF:					003-TW-P10-F1	

METALS (µg/L)

ALUMINUM	18 U	26 U	18 U	26 U	26 U	26 U
ANTIMONY	19 U	16 U	19 U	16 U	16 U	16 U
ARSENIC	1 U	1.6	1 U	6.9	8	5.2 J
BARIUM	27.8 J	45.8 J	75 J	65.3 J	66.2 J	71.4 J
BERYLLIUM	0.3	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	2 U	2 U	2 U	2 U	2 U	2 U
CALCIUM	121000 J	182000 J	185000 J	137000 J	141000 J	131000 J
CHROMIUM	6.7	13.8	15.8	7.2	6.3	13.9
COBALT	2 U	8.3	2 U	5 U	5 U	5 U
COPPER	3 U	3 U	3.8	3 U	3 U	3 U
IRON	1360 J	2240 J	2230 J	6620 J	6860 J	1230 J
LEAD	1 UJ	1 U	1 U	1 U	1 U	1 U
MAGNESIUM	29300 J	43500 J	33100 J	38100 J	38900 J	57900 J
MANGANESE	1480 J	2070 J	533 J	634 J	657 J	2820 J
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	4.1	24.5	8.2	5 U	5 U	7.1
POTASSIUM	3600	4600	3620 J	2650	2700	3820
SELENIUM	39.2 J	1 UJ	16.9 J	1 UJ	1 UJ	5 UR
SILVER	3 U	3 U	3 U	4.6 U	3.1 U	3 U
SODIUM	11600 J	11900 J	55800	18800 J	18900 J	13900 J
THALLIUM	1 U	1 UJ	1 UJ	1 UJ	1 UJ	1.8 U
VANADIUM	4.2 U	2 U	2	2 U	2 U	3.1 U
ZINC	14.5 U	10.8 U	11.4 U	5.5 U	4.5 U	5.3 U

Blank space indicates that the sample was not analyzed for this particular parameter.

**ANALYTICAL RESULTS FOR FILTERED GROUNDWATER
NIROP FRIDLEY, MINNESOTA**

SAMPLE NUMBER:	003-TW-P12-F1	GW-01-F	GW-02-F	DUP-03-F	GW-03-F	
DEPTH:	Shallow	Shallow	Shallow	Shallow	Shallow	
SAMPLE DATE:	08/10/97	04/17/95	04/17/95	04/17/95	04/07/95	/ /
INVESTIGATION:	OU3	EAST PLATING	EAST PLATING	EAST PLATING	EAST PLATING	
LOCATION:	P12	SB-01/TW-01	SB-04/TW-02	SB-04/TW-02	SB-06/TW-03	
FIELD DUPLICATE OF:				GW-02-F		

METALS (µg/L)

ALUMINUM	18 U	46.5 U	370	44 U	35 U	
ANTIMONY	19 U	50 U	50 U	50 U	50 U	
ARSENIC	7.2	4.9	2 U	2 U	2 U	
BARIUM	138	147	100	89.9	47.1 U	
BERYLLIUM	0.3 U	1 U	1 U	1 U	1 U	
CADMIUM	2 U	6.1 U	6 U	3 U	3 U	
CALCIUM	163000	91500	182000	194000	153000	
CHROMIUM	11.7 U	5 U	5 U	5 U	5 U	
COBALT	2.2	12.2	9 U	9 U	9 U	
COPPER	3 U	23.6	18.8	21.1	6 U	
IRON	17700 J	50.5 U	348	44.7 U	41.1 U	
LEAD	1 U	2 U	2 U	2 U	2 U	
MAGNESIUM	34000 J	30200	55500	58500	42600	
MANGANESE	472 J	201	890	947	199	
MERCURY	0.2 U	0.14 U	0.14 U	0.13 U	0.13 U	
NICKEL	4 U	20.9 U	15.4 U	9 U	9 U	
POTASSIUM	3580	5730	4610	4640	5480	
SELENIUM	5 UR	4 U	4 U	4 U	36.7	
SILVER	3 U	5 U	5 U	5 U	5 U	
SODIUM	13000 J	90800	9010	9640	11500	
THALLIUM	1 UJ	5 U	5 U	5 U	5 U	
VANADIUM	2 U	5 U	5 U	5 U	5 U	
ZINC	6.7 U	5 U	5 U	5 U	5 U	

Blank space indicates that the sample was not analyzed for this particular parameter.

APPENDIX F

DATA VALIDATION

DATA VALIDATION SUMMARY

F.1.0 INTRODUCTION

All analytical data from samples sent to the fixed base laboratory (Laucks Testing Laboratories, Inc.) as part of the NIROP Fridley Remedial Investigation were subjected to data validation. Data validation is an objective systematic process in which analytical data are reviewed against a set of criteria to ascertain the validity of the reported results and to identify for the data user the possible limitations of these results. The following section summarizes the various aspects of the data validation process.

F.2.0 GENERAL DATA VALIDATION PROCEDURES

All data generated using United States Environmental Protection Agency (U.S. EPA) Contract Laboratory Program (CLP) methods were validated in accordance with the U.S. EPA Region V Standard Operating Procedures (SOPs) for Validation of CLP Organic and Inorganic Data. Validation for non-CLP methods was performed in accordance with the Region V data validation SOPs to the greatest extent practicable in view of method-specific quality assurance/quality control (QA/QC) requirements and criteria outlined in the NIROP Fridley Quality Assurance Project Plan (QAPP).

The organic data validation process included consideration of the following: data completeness, holding time compliance, instrument performance checks such as mass spectral tuning ratios and gas chromatographic (GC) performance evaluation mixture degradation, initial calibration data (minimum response factors and relative standard deviation), continuing calibration data (minimum response factors and percent differences), field QC and laboratory-generated blanks, internal standard area recoveries and retention time control, system monitoring compounds and surrogate spikes, matrix spikes and blank spikes, field duplicate precision, analytical sequence verification, chemical interferences, target compound identification (mass spectral and retention time criteria), target compound quantitation, and sample quantitation limits.

The inorganic data validation process included consideration of the following: comparison of sample result forms to raw data, evaluation of preparation logs and measurement readout records for each type of analysis, holding times and sample preservation, calibration (initial calibration verification and continuing calibration recoveries), laboratory calibration blanks and preparation blanks, inductively coupled plasma (ICP) interference check sample recoveries, matrix spike recoveries, laboratory control sample recoveries, laboratory and field duplicate precision, ICP serial dilution accuracy, graphite furnace atomic absorption post

digestion spike recoveries, duplicate burn precision, standard additions, field QC blanks, and verification of instrumental parameters (instrument detection limits, linear ranges, and ICP interelement correction factors).

The results of the validation process were summarized in SDG-specific technical reports consisting of a memorandum, a section of qualified analytical results, and a supporting documentation section which provided the rationale for changes and/or qualification of the data. These memoranda provided a detailed explanation of the results of the data validation review. Copies of the validation memoranda are included in Appendix F.2 of the RI report. All other data validation documentation is currently retained on file by Tetra Tech NUS, Inc.

F.3.0 DATA VALIDATION QUALIFIERS

As mentioned previously, the qualification of analytical data during the validation process (i.e., the application of U, J, UJ, UR, and R qualifiers) was conducted as required by Region V data validation SOPs. The addition of the data qualifiers to analytical results signifies the occurrence of QC noncompliances that have been noted during the course of data validation. The various data qualifiers are defined as follows:

- **U** - Indicates that the chemical was not detected at the numerical detection limit (quantitation limit) noted. Nondetected results from the laboratory are reported in this manner. This qualifier is added to a positive result (reported by the laboratory) if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis.
- **UJ** - Indicates that the chemical was not detected. However, the detection limit (quantitation limit) is considered to be estimated based on problems encountered during laboratory analysis.
- **J** - Indicates that the chemical was detected. However, the laboratory-reported quantity is considered to be an estimate of the concentration that is actually present in the sample.
- **UR** - Indicates that the nondetected analytical result reported by the laboratory is considered to be unreliable or unusable and has been rejected. The chemical may or may not be present. This qualifier is applied in cases of gross technical deficiencies (e.g., holding times missed by a factor of two times the specified limit, severe calibration noncompliance, and extremely low QC recoveries).

- **R** - Indicates that the positive analytical result reported by the laboratory is considered to be unreliable and unusable and has been rejected. The chemical may or may not be present. This qualifier is applied in cases of gross technical deficiencies.

The preceding data qualifiers may be categorized as indicative of major problems and minor problems. Major problems are defined as issues that result in the rejection of data, qualified with UR and R data validation qualifiers. These data are considered invalid and are not used for risk assessment and decision making. Minor problems are defined as issues resulting in the estimation of data, qualified with the U, J, and UJ validation qualifiers. Estimated analytical results are considered to be suitable for risk assessment and decision making purposes.

F.4.0 SUMMARY OF DATA VALIDATION RESULTS

A brief summary of the data validation results for the NIROP Fridley RI is provided in the following paragraphs. The overall percent completeness of the data (i.e., the number of results determined to be valid divided by the total number of results planned) for the OU3 RI is 99.2%. Percent completeness calculated separately for soil and water matrices was 99.8 percent (soils) and 98.2 percent (waters). Therefore, the completeness objective of 95 percent and the data quality objectives for the project were met. The following subsections provide, for organic and inorganic analytical results, further detail regarding rejected results and their associated significance. These subsections also summarize results qualified as false positives based on evidence of laboratory and/or field blank contamination. A brief listing of the types of minor analytical deficiencies resulting in the qualification of data as estimated is also given. All validated analytical results for the RI are presented in Appendix E of the RI report (Analytical Database).

Organics Analyses

Table F-1 summarizes the contaminants detected in each type of field QC blank or laboratory blank. Positive results at concentrations less than the blank action level were qualified U, indicating that they are false positives attributable to field/laboratory blank contamination. Positive results at concentrations greater than the blank action level were qualified J, indicating that results are estimated based on field/laboratory blank contamination. Acetone, methylene chloride, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate were frequently detected in laboratory blanks and field QC blanks. These compounds are common laboratory contaminants and were detected more often in laboratory blanks than in field QC blanks. Methylene chloride and acetone were not used in the field; therefore, laboratory sources are likely to be responsible for the sporadic detection of low levels of these compounds in field QC blanks.

Chloroform, bromodichloromethane, dibromochloromethane, and bromoform were detected most frequently in batch blanks and in the source water blanks comprised of the water used in the first stage of sampling equipment decontamination. These compounds are trihalomethanes (water supply treatment byproducts) related to the source water used for these blanks.

Other field QC blank contaminants were detected very infrequently and at trace concentrations below quantitation limits. Because trichloroethene was detected in only one source water blank and at a concentration of 0.2 ug/L, the single detection of this trace level (representing only one-fifth of the sample quantitation limit) does not suggest a significant or consistent problem in the field sampling equipment decontamination source water.

Table F-1

**Organic Compounds Detected in Fixed Base Laboratory Blank Analyses
NIROP Fridley, Minnesota**

Compound	Field QC Blanks			Laboratory Method Blanks	
	Trip Blanks	Source Water	Batch Blanks	Aqueous Method Blanks	Solid Method Blanks
Acetone	X	X	X	X	X
Methylene Chloride	X		X	X	X
Chloroform	X	X	X	X	
Bromodichloromethane	X	X	X		
Dibromochloromethane		X			
Bromoform		X			
Chloromethane		X			
Trichloroethene		X			
Toluene	X				X
2-Hexanone					X
Diethyl Phthalate			X	X	
Di-n-butyl Phthalate			X	X	X
Bis(2-ethylhexyl) Phthalate			X	X	X
Di-n-octyl Phthalate					X

The primary cause of data rejection (R or UR qualifiers) was the occurrence during calibrations associated with aqueous samples only of initial and/or continuing calibration response factors for three ketones (acetone, 2-butanone, and 2-hexanone) that were below the 0.05 lower QC limit. These compounds have characteristically low response factors in the analytical method because their high water

solubilities suppress their purge efficiencies in the analysis. The use of a 25 mL purge volume, as required for low-concentration volatile analysis, further decreases the purge efficiencies of these compounds. None of the media sampled (subsurface soil or groundwater) indicated 2-butanone or 2-hexanone were present except very infrequently and/or at levels near or below quantitation limits. In addition, many reported results for acetone were considered to be and qualified as nondetected due to blank contamination. Since all detections of these three ketones were several orders of magnitude below soil and groundwater benchmark criteria, it is not likely that the rejected nondetects mask the presence of significant concentration levels or represent a critical data gap at the NIROP Fridley site.

In addition, in several samples analytical results for organic compounds were qualified as estimated, J or UJ, for observed noncompliances with initial and continuing calibrations (high percent relative standard deviation or percent difference in response factors) and high or low volatile matrix spike recoveries. In isolated cases, results were also qualified as estimated due to low volatile internal standard area recoveries, a high dual-column percent difference in PCB quantitation results, a low PCB surrogate percent recovery, and low semivolatile matrix spike recoveries. Results for one soil sample were qualified as estimated for semivolatiles and PCBs because of exceeded holding times before extraction and results for 1,1-dichloroethene in a field duplicate pair were qualified estimated because of a high relative percent difference between the detected concentrations in the original and duplicate sample. Positive results reported at concentrations less than the Contract Required Quantitation Limit (CRQL) were also qualified as estimated.

Data validation criteria often differ from the requirements of associated analytical methods. Therefore, although the laboratory met applicable analytical requirements, there were still calibration problems, low recoveries for matrix and surrogate spikes, low internal standard areas, and differences between duplicate analysis results and PCB dual column analysis results that caused the qualification of data but were not associated with improper laboratory practices or lack of adherence to laboratory methods. None of the minor problems that caused data to be qualified as estimated were anticipated to be of significant concern at NIROP Fridley.

Table F-2 summarizes the tentatively identified compounds (TICs) detected in each environmental medium sampled at NIROP Fridley. Although many of the samples were analyzed for volatiles only, most TICs were noted in the semivolatile fraction. TICs representing probable or possible constituents of hydrocarbon fuels were found in a small proportion of soil samples.

Table F-2

Summary of Tentatively Identified Compounds (TICs)
NIROP Fridley, Minnesota

Reported TIC	Soil	Groundwater		Interpreted Significance
		Mon. Wells	Temporary Wells	
Class Alkanes (Saturated Hydrocarbons), such as:				All are probable or possible fuel components
dodecane	X			
undecane	X			
dimethyl octane	X			
trimethyl hexane	X			
tridecane	X			
octane	X			
nonane			X	
methyl nonane	X			
methyl octane	X			
methyl decane	X			
dimethyl heptane	X			
unknown alkane	X		X	
unknown hydrocarbon	X			
Class Cycloalkanes (Cyclic Hydrocarbons), such as:				All are probable or possible fuel components
butyl cyclohexane	X			
1,1,3-trimethylcyclohexane	X			
propyl cyclohexane	X			
cyclohexanone		X		
substituted cyclohexane	X			
decahydronaphthalene	X			
Alkyl-Substituted Aromatic Hydrocarbons, such as:				All are probable or possible fuel components
propyl benzene			X	
unknown trimethyl benzene			X	
C4 substituted benzene	X			
C5 substituted benzene	X			
Other Substituted Cyclic Hydrocarbons, such as:				
limonene	X			a monoterpene plant metabolite
cholesterol	X			a steroid (secondary metabolite)
unknown substituted benzene	X		X	
caprolactam		X		a cyclic amide, a nylon monomer
1H-indene isomer	X			Associated with other PAHs

Table F-2

Summary of Tentatively Identified Compounds (TICs)
NIROP Fridley, Minnesota

Reported TIC	Soil	Groundwater		Interpreted Significance
		Mon. Wells	Temporary Wells	
Alkyl-Substituted Polyaromatic Hydrocarbons (PAHs), such as:				
1-methylnaphthalene	X			Associated with other PAHs
C2 naphthalene	X			Associated with other PAHs
C3 naphthalene	X			Associated with other PAHs
methyl phenanthrene	X			Associated with other PAHs
C2 phenanthrene	X			Associated with other PAHs
unknown PAH	X			Associated with other PAHs
Oxygen-Substituted Aromatic Hydrocarbons, such as:				
methyl benzaldehyde			X	
benzaldehyde	X			
acetophenone	X			
phosphoric acid, triphenyl ester	X			
2,4-dimethyl-2-phenyl-1,3-dioxolane			X	
Derivatives of Organic Acids and Phenols:				
unknown phthalate	X			a plasticizer
acetic acid, butyl ester	X			
methyl benzoic acid			X	
unknown organic acid			X	
ethyl phenol			X	
Sulfur-Containing Compounds:				
molecular sulfur, S8	X	X	X	
dibenzothiophene	X			sometimes associated with PAHs
methyldibenzothiophene	X			sometimes associated with PAHs
Nitrogen-Substituted Aromatic Hydrocarbons, such as:				
N-propylbenzamide			X	an amide
Miscellaneous:				
2-ethylhexanol		X		an alcohol
unknown alcohol	X			
Bromacil			X	an herbicide
Chlorofluorocarbons:				
1,1,2-trichloro-1,2,2-trifluoroethane	X			a common freon solvent
trichloromonofluoromethane			X	a common freon solvent

Table F-2
Summary of Tentatively Identified Compounds (TICs)
NIROP Fridley, Minnesota

Reported TIC	Soil	Groundwater		Interpreted Significance
		Mon. Wells	Temporary Wells	
Known or Probable Laboratory Artifacts (Contaminants):				
perfluorotributylamine (FC43)	X			Compound used in tuning mass spectrometer
octamethylcyclotrisiloxane	X			GC column bleed
pentamethylcyclotrisiloxane			X	GC column bleed
Known or Probable Laboratory Artifacts (Contaminants):				
dodecamethylcyclotrisiloxane			X	GC column bleed
hexamethylcyclotrisiloxane			X	GC column bleed
cyclohexanone		X		reaction artifact of cyclohexene used in GPC cleanup
aldol condensate	X	X	X	reaction artifact of acetone solvent from sample extraction

The possible fuel-related TICs were categorized as alkanes (saturated hydrocarbons), cycloalkanes (cyclic hydrocarbons), and alkyl-substituted aromatic hydrocarbons. In addition, a few soil samples also contained lighter and mid-molecular weight alkyl-substituted polyaromatic hydrocarbons (PAHs), which may also be related to mid-weight oils or fuels.

While TIC results are not considered to be accurate for quantitative risk assessment or decision making, the lighter-boiling range constituents of fuels can still be adequately characterized in NIROP Fridley samples by the volatile and semivolatile target compound results, which generate quantitative data for the more important constituents of concern such as benzene and naphthalene. Similarly, the mid-boiling range components of hydrocarbon oils/fuels are representatively characterized by the target compound analysis of the semivolatile fraction, which includes several common PAH compounds that have been studied and classified as to their potential carcinogenic properties or non-cancer toxicities. Therefore, the fuel-related constituents of soil samples can be evaluated using the data for target compounds of the same chemical classes as the detected TICs, which provides sufficient information for risk assessment or for comparisons to chemical-specific regulatory criteria.

TICs belonging to other miscellaneous chemical classes were detected at very low frequencies and were found in soil samples at concentrations generally restricted to the low tens to the low hundreds of parts-per-billion (µg/kg). Miscellaneous TICs were categorized as substituted cyclic hydrocarbons, oxygen-

substituted aromatic hydrocarbons, derivatives of organic acids and phenols, sulfur-containing compounds, nitrogen-substituted aromatic hydrocarbons, and chlorofluorocarbons. Several of these TICs are considered potentially naturally occurring, including the cyclic hydrocarbons limonene, cholesterol, and molecular sulfur. Other substances are potentially related to anthropogenic compounds, including an unknown phthalate (a plasticizer), the herbicide Bromacil, the fluorocarbons 1,1,2-trichloro-1,2,2-trifluoroethane and trichloromonofluoromethane, and a surfactant (triphenyl ester of phosphoric acid).

The highly infrequent detections of certain oxygen-substituted aromatic TICs may or may not be anthropogenic in nature because secondary metabolic products and biological degradation pathways cannot be ruled out as plausible sources of these substances. These TICs include two alcohols, the organic acids ethyl phenol, methyl benzoic acid, an ester of acetic acid, and the oxygen-substituted aromatic hydrocarbons benzaldehyde, methyl benzaldehyde, acetophenone, and 2,4-dimethyl-2-phenyl-1,3-dioxolane. The oxygen-substituted aromatics were generally found at levels restricted to the low tens to low hundreds of parts-per-billion. Most oxygen-substituted aromatic hydrocarbons have only low to moderate toxicity; therefore, it is unlikely that the lack of accurate quantitative results for these TICs would represent a significant data gap that might underestimate the potential for future health risks at the NIROP Fridley site.

Several TICs found in subsurface soil and groundwater samples are among chemicals that were also detected in laboratory and field QC blanks or are common laboratory reagents or byproducts thereof. The TICs detected in NIROP Fridley samples that are considered to be known or probable laboratory artifacts include perfluorotributylamine, several alkyl-substituted cyclotrisiloxanes, cyclohexanone, and aldol condensates of acetone. Because these substances are known laboratory artifacts they should not be assumed to be present in any of the samples in which they were detected.

Inorganic Analyses

Table F-3 summarizes the contaminants detected in each type of field QC blank or laboratory blank. Positive results at concentrations less than the blank action level were qualified U, indicating that they are false positives attributable to field/laboratory blank contamination. Positive results at concentrations greater than the blank action level were qualified J, indicating that results are estimated based on field/laboratory blank contamination. Nondetect (U) qualifiers were applied to one or more samples for each of the metals listed in Table F-3, except for magnesium, for which all results were greater than the respective action levels. Estimated (J) qualifiers were applied to one or more samples for each of the metals listed in Table F-3, except for cadmium, chromium, and silver, for which all results were less than

the respective action levels. Common minerals were more frequently detected in laboratory blanks and field QC blanks. Other metals were detected on an infrequent basis in blanks.

Table F-3

**Inorganic Parameters Detected in Fixed Base Laboratory Blank Analyses
NIROP Fridley, Minnesota**

Compound	Field QC Blanks		Laboratory Method Blanks	
	Source Water	Batch Blanks	Aqueous Method Blanks	Solid Method Blanks
Aluminum	X		X	X
Arsenic	X		X	X
Barium	X		X	X
Beryllium			X	X
Cadmium			X	X
Calcium	X		X	X
Chromium	X		X	X
Cobalt			X	X
Copper	X			X
Iron	X		X	X
Lead	X		X	X
Magnesium	X		X	X
Manganese	X		X	X
Nickel			X	X
Potassium	X		X	X
Selenium			X	X
Silver			X	X
Sodium	X		X	X
Thallium			X	X
Vanadium			X	X
Zinc	X		X	X
Total Organic Carbon				X

The only cause of inorganic data rejection was the occurrence of matrix spike recoveries below 30 percent for antimony in one SDG, selenium in four SDGs, and thallium in one SDG. Antimony and selenium results were rejected, qualified UR, in solid samples 003-SB-018-02, 003-SB-034-01, 003-SB-034-03, 003-SB-035-01, 003-SB-035-02, 003-SB-054-01, 003-SB-054-02, 003-SB-074-01, 003-SB-074-03, and 003-SB-DP1-02. Antimony results were rejected, qualified UR, in solid samples 003-SB-P02-01, 003-SB-P02-03, 003-SB-058-01, 003-SB-058-03, and 003-SB-DP1-04. Selenium results were rejected, qualified UR, in aqueous samples 003-TW-026-01, 003-TW-028-01, 003-TW-033-01, 003-TW-046-01, 003-TW-068-01, 003-TW-071-01, 003-TW-P11-01, 003-TW-P11-F1, 003-TW-P12-01, 003-TW-P12-F1, 003-AB-003-01, 003-AB-004-01, and 003-AB-005-01 and in solid samples 003-SB-037-01, 003-SB-037-03, 003-SB-063-01, 003-SB-063-03, 003-SB-P01-01, 003-SB-P01-02, 003-SB-P06-01, and 003-SB-P06-03. Thallium results were rejected, qualified UR, in solid samples 003-SB-023-01, 003-SB-023-03, 003-SB-P12-01, and 003-SB-P12-03.

In several SDGs, analytical results for inorganic substances were qualified as estimated, J or UJ, for observed noncompliances involving matrix spikes and post digestion spikes. Soil matrix spike recoveries were below the lower 75 percent QC limit for antimony, arsenic, copper, lead, selenium, and cyanide, resulting in the qualification of associated positive and nondetect results as estimated. Soil matrix spike recoveries were less than 30 percent for lead and selenium, which also resulted in the qualification of positive results as estimated. Aqueous matrix spike recoveries were below the lower 75 percent QC limit for selenium, thallium, and cyanide, which similarly affected positive and nondetect results. Aqueous matrix spike recoveries were below the lower 30 percent QC limit for selenium, which also resulted in the qualification of associated positive results as estimated. Soil matrix spike recoveries were above the upper 125 percent QC limit for arsenic, lead, manganese, and mercury, resulting in the qualification of associated positive results as estimated. Aqueous matrix spike recoveries were above the upper 125 percent QC limit for iron and sulfate, resulting in the qualification of associated positive results as estimated. The matrix spike recoveries were validated using the U.S. EPA and Region V SOPs for inorganic analyses. These SOPs specify an acceptable range of 75% to 125% for matrix spike recoveries associated with analysis using CLP methodologies (which also specify a 75% to 125% range). However, the MPCA preferred range is 80% to 120%. Upon review of the data using the range as specified by the MPCA, some samples may be biased low if the recoveries were below the MPCA recovery range. It should be noted that all LCSs fell within the acceptable range of 80% to 120%.

Soil post digestion spike recoveries were below the lower 85 percent QC limit for selenium and thallium, resulting in the qualification of associated positive and nondetect results as estimated. Aqueous post digestion spike recoveries were below the lower 85 percent QC limit for arsenic, lead, selenium, and thallium, which similarly affected positive and nondetect results. Soil and aqueous post digestion spike recoveries were above the upper 115 percent QC limit for arsenic, resulting in the qualification of associated positive results as estimated.

In isolated cases, results were also qualified as estimated due to serial dilutions, laboratory duplicates, field duplicates, interference check standards, and method of standard additions. Field duplicate relative percent differences (RPDs) exceeded control limits for soil for barium, chromium, lead, and manganese, resulting in the qualification of associated positive results as estimated. Field duplicate RPDs exceeded control limits for water for zinc, which similarly affected positive results. Laboratory duplicate RPDs exceeded control limits for soil for calcium, chromium, copper, iron, lead, magnesium, manganese, and mercury and control limits for water for aluminum. Serial dilution percent differences (PDs) exceeded the 10 percent control limit in aqueous samples for barium, manganese, and zinc and in soil samples for aluminum, barium, calcium, iron, magnesium, manganese, and zinc. Associated positive results were

qualified J, estimated, for this problem. Several positive results for selenium were qualified J, estimated, because of correlation coefficients less than the QC limit of 0.995 in the method of standard addition analysis of these samples.

Interference check standards indicated a potential bias in positive and nondetect results for antimony, cobalt, and nickel in soil and water samples containing calcium at levels which were similar to the concentration of this mineral in the interference check standard. Similarly, interference check standards indicated a potential bias in results for antimony, cobalt, and silver in soil samples containing iron at levels which were similar to the concentration of this mineral in the interference check standard.

Hexavalent chromium was qualified as estimated, UJ, in one sample for which the holding time slightly exceeded the maximum holding time requirement.

As previously noted, data validation criteria often differ from the requirements of associated analytical methods. Therefore, although the laboratory met inorganic analytical requirements with the exception of the one noncompliance with holding times noted above, there were still low and high recoveries for matrix spikes, low and high post digestion spikes, high serial dilution PDs, interference check sample biases, low correlation coefficients in method of standard addition analyses, and high RPDs in laboratory and field duplicate analysis results that caused the qualification of data but were not associated with improper laboratory practices or lack of adherence to laboratory methods. Only one type of major problem was associated with inorganic data (rejected antimony, selenium, and thallium nondetected results due to low matrix spikes), which, because of the generally low levels of these elements found in other samples, was not expected to be of significant concern at NIROP Fridley. In addition, none of the minor problems that caused inorganic data to be qualified as estimated were anticipated to create data gaps or problems with data usability.

For 3,168 metals for OU-3 soils, 1,362 were qualified either J, UJ, R, or UR. Therefore, the percentage not qualified is 57%. The Navy notes that EPA risk assessment guidance permits the use of data qualifiers J or UJ in risk assessment.

C-49-10-7-097

TO: MR. MARK SLADIC DATE: OCTOBER 13, 1997
FROM: BONNI J. SMATHERS COPIES: DV FILE
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003 NIROP, FRIDLEY, MINNESOTA
SDG BRF01

SAMPLES: 10/Solid/

003-SB-003-01 003-SB-003-02 003-SB-006-01
003-SB-006-03 003-SB-013-01 003-SB-013-02
003-SB-P03-01 003-SB-P03-03 003-SB-P07-01
003-SB-P07-03

12/Aqueous/

003-BB-001-01 003-BB-002-01 003-TB-001-01
003-TB-002-01 003-TB-003-01 003-TB-004-01
003-TB-005-01 003-TW-003-01 003-TW-006-01
003-TW-013-01 003-TW-P03-01 003-TW-P07-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley SDG BRF01 consists of ten (10) solid environmental samples, five (5) aqueous samples, two (2) bubble blanks and five (5) trip blanks. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB compounds). No field duplicate pair was included in this SDG. Samples 003-TW-P03-01 and 003-SB-013-01 were designated by the field crew for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses.

The samples were collected by Brown and Root Environmental on July 8th through July 15th, 1997 and analyzed by Laucks Testing Labs. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Contract Laboratory Program (CLP) Statement of Work (SOW) 8260 and 8270B analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- * • Internal Standard Performance
- * • Matrix spike results
- * • Blank spike results
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits
- * • Tentatively identified compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 13, 1997 - PAGE 2

acetone. Positive and nondetected results are affected by this noncompliance. Positive results for acetone were qualified as estimated, (J), in the affected samples.

Initial and Continuing Calibration Relative Response Factors (RRFs) for acetone and 2-butanone were less than 0.050. This noncompliance indicates a lack of instrument response. Positive and nondetected results are affected by this noncompliance. Positive results reported for these compounds were qualified as estimated, (J). Nondetected results reported for these compounds in the affected samples were considered unreliable and were rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for chloroethane, chloromethane, vinyl chloride, 1,2-dichloropropane, 2-butanone, 2-hexanone and 4-methyl-2-pentanone. Positive and nondetected results are affected by these noncompliances. Therefore, positive and nondetected results reported for the aforementioned compounds were qualified as estimated, (J) and (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene chloride*	1.6 ug/L	16 ug/L
Acetone*	4.2 ug/L	42 ug/L
Bromodichloromethane*	0.3 ug/L	3 ug/L
Chloroform*	26 ug/L	130 ug/L

Samples affected: All aqueous samples.

* - Maximum concentration detected in a field quality control blank.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	4 ug/kg	40 ug/kg

Samples affected: All soil samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 13, 1997 - PAGE 3

Dilution factors, percent moisture and sample aliquot, were taken into consideration during the application of all action levels. Actions as indicated above were taken for methylene chloride and chloroform. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Semivolatiles

Continuing calibration Percent Differences (%Ds) greater than the 25% quality control limit were reported for bis(2-chloroisopropyl)ether, carbazole, pyridine, 4-nitroaniline, and 4-nitrophenol. Positive and nondetected results are affected by these noncompliances. Therefore, nondetected results for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
bis(2-ethylhexyl)phthalate	110 ug/kg	550 ug/kg
bis(2-ethylhexyl)phthalate	1 ug/L	10 ug/L

Samples affected: All soil samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture, and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for bis(2-ethylhexyl)phthalate.

A low surrogate Percent Recovery (%R) was reported for terphenyl-d14 in sample 003-TW-P07-01. No action was taken since only one fractional surrogate was noncompliant.

PCB

No problems were noted with the PCB fraction.

Additional Comments

Positive results for trichloroethene were reported at concentrations which exceeded the linear calibration range of the instrument in samples 003-TW-003-01 and 003-TW-006-01. Positive results for cis-1,2-dichloroethene and trichloroethene in sample 003-TW-013-01 and for cis-1,2-dichloroethene, trichloroethene and trans-1,2-dichloroethene in sample 003-TW-P07-01 were also reported at concentrations which exceeded the linear calibration range of the instrument. As a result, the laboratory reanalyzed these samples at a dilution. The original analyses, with the exception of the exceeded results, were used in validation. The results for the aforementioned compounds from the diluted analysis were transposed over the original results and used in validation.

Positive results for benzo(a)anthracene, benzo(b)fluoranthene, fluoranthene, phenanthrene, and pyrene were reported at concentrations which exceeded the linear calibration range of the instrument in sample 003-SB-P03-01. Consequently, the laboratory reanalyzed this sample at a dilution. The original analysis, with the exception of the exceeded results, were used in validation. The results for the aforementioned compounds from the diluted analysis were transposed over the original results and used in validation.

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 13, 1997 - PAGE 4

Laboratory Performance Issues: **Laboratory Performance Issues:** An initial calibration %RSD greater than the 30% quality control limit was reported for the volatile compound acetone. An initial Calibration RRF less than 0.050 was reported for acetone and 2-butanone. Continuing calibration %Ds greater than the 25% quality control limit were also reported for several volatile and semivolatile compounds. Methylene chloride was detected in the volatile laboratory method blanks.

Other Factors Affecting Data Quality: A poor surrogate recovery was reported for terphenyl-d14 in the semivolatile fraction.

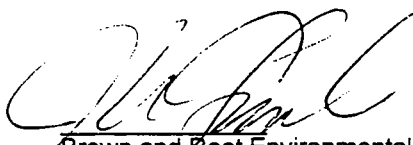
MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 13, 1997 - PAGE 5

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), US EPA Region V Standard Operating Procedures for Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Bonni J. Smathers
Industrial Hygienist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF01

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.		VOA		SVOA	<i>P.C.D.</i> PEST
003-SB-003-01	A ¹	J ^{2,3,8}	A ³	J ^{6,8}	
003-SB-003-02	A ¹	J ^{2,3,8}	A ³	J ^{7,8}	
003-SB-006-01	A ¹	J ^{2,3,8}	A ³	J ^{6,8}	
003-SB-006-03	A ¹	J ^{2,3,8}	A ³	J ^{6,8}	
003-SB-013-01	A ¹	J ^{2,3,8}	A ³	J ^{7,8}	
003-SB-013-02	A ¹	J ^{2,3,8}	A ³	J ^{7,8}	
003-SB-P03-01	A ¹	J ^{2,3,8}	A ³	J ^{6,8}	
003-SB-P03-03	A ¹	J ^{2,3,8}	A ³	J ⁶	
003-SB-P07-01	A ¹	J ^{2,3,8}	A ³	J ⁶	
003-SB-P07-03	A ¹	J ^{2,3,8}		J ⁶	
003-BB-001-01		J ^{1,8}	R ¹	J ^{5,8}	
003-BB-002-01		J ^{1,8}	R ¹	J ^{5,8}	
003-TB-001-01		J ⁸	R ¹		
003-TB-002-01		J ⁸	R ¹		
003-TB-003-01		J ⁸	R ¹		
003-TB-004-01		J ⁸	R ¹		
003-TB-005-01			R ¹		
003-TW-003-01		J ⁸	R ¹	A ³	J ^{5,8}
003-TW-006-01			R ¹	A ³	J ^{4,8}
003-TW-013-01		J ⁸	R ¹		J ⁵
003-TW-P03-01		J ⁸	R ¹		J ^{5,8}
003-TW-P07-01	A ²	J ⁸	R ²		J ^{5,8}

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify positive results for methylene chloride as nondetected, (U), as a result of laboratory blank contamination.
- A² - Accept data, but qualify positive results for chloroform as nondetected, (U), as a result of laboratory blank contamination.
- A³ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of an initial and continuing calibration response factor less than 0.05.
- J² - Accept data, but qualify positive results for acetone as estimated, (J), as a result of an initial calibration %RSD greater than 30%.
- J³ - Accept data, but qualify positive and nondetected results for chloroethane, chloromethane, vinyl chloride, 1,2-dichloropropane, 2-butanone, 2-hexanone, and 4-methyl-2-pentanone as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify nondetected results for bis(2-chloroisopropyl)ether, carbazole, pyridine, 4-nitroaniline and 4-nitrophenol as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.
- J⁵ - Accept data, but qualify nondetected results for bis(2-chloroisopropyl)ether, carbazole, pyridine, and 4-nitroaniline as estimated, (UJ), as a result of a continuing calibration %D

MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 13, 1997 - PAGE 7
greater than 25%.

- J⁶ - Accept data, but qualify nondetected results for pyridine, 4-nitroaniline, bis(2-chloroispropyl) ether and/or 4-nitrophenol as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.
- J⁷ - Accept data, but qualify nondetected results for pyridine as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.
- J⁸ - Accept data, but qualify positive results reported below the CRQL as estimated, (J).
- R¹ - Reject data and qualify nondetected results for acetone and 2-butanone as unreliable,(UR), as a result of initial and continuing calibration RRFs less than 0.050.
- R² - Reject data and qualify nondetected results for acetone and 2-butanone as unreliable,(UR), as a result of a continuing calibration RRF less than 0.050.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Substituted Benzene
Semivolatile	Unknown(s) Unknown aldol condensate(s) Unknown PAH(s) Unknown alkane(s) Unknown hydrocarbon



C-49-10-7-140

TO: M. SLADIC **DATE: OCTOBER 21, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF01

SAMPLES:	10/Soils/			
	003-SB-003-01	003-SB-003-02	003-SB-006-01	003-SB-006-03
	003-SB-013-01	003-SB-013-02	003-SB-P03-01	003-SB-P03-03
	003-SB-P07-01	003-SB-P07-03		
	7/Aqueous/			
	003-BB-001-01	003-BB-002-01	003-TW-003-01	003-TW-006-01
	003-TW-013-01	003-TW-P03-01	003-TW-P07-01	

The sample set for CTO 003, NIROP Fridley, SDG BRF01, consists of ten (10) soil environmental samples and seven (7) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on July 8, 9, 10, 11, 12, 13, 14 and 15 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- * • Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- * • GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: OCTOBER 21, 1997 - PAGE 2

C-49-10-7-140

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	43.8 ug/L	219 ug/L	43.8 mg/kg
arsenic	1.9 ug/L	9.5 ug/L	1.9 mg/kg
barium	1.9 ug/L	9.5 ug/L	1.9 mg/kg
calcium	23.3 ug/L	116.5 ug/L	NA
calcium ⁽¹⁾	6.780 mg/kg	NA	33.9 mg/kg
cobalt	3.5 ug/L	17.5 ug/L	3.5 mg/kg
iron	6.7 ug/L	33.5 ug/L	6.7 mg/kg
magnesium	39.9 ug/L	199.5 ug/L	39.9 mg/kg
potassium ⁽¹⁾	20.320 mg/kg	NA	101.6 mg/kg
selenium	1.1 ug/L	5.5 ug/L	1.1 mg/kg
sodium ⁽²⁾	38.600 ug/L	193 ug/L	NA
zinc ⁽¹⁾	1.280 mg/kg	NA	6.4 mg/kg
zinc ⁽²⁾	4.00 ug/L	20.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, arsenic, calcium, cobalt, sodium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, arsenic, barium, calcium, cobalt, iron, magnesium, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for manganese and mercury affecting the soil matrix were > 125% quality control limit. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

The MS %R for antimony affecting the soil matrix was < 75% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analyte in the affected samples were qualified as estimated, "J" and "UJ", respectively.

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DATE: OCTOBER 21, 1997 - PAGE 3

C-49-10-7-140

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for lead was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-003-01. The nondetected result reported for lead in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-006-01, 003-BB-002-01, 003-TW-P03-01, 003-TW-003-01 and 003-TW-013-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-006-01, 003-TW-P03-01, 003-TW-003-01, 003-TW-013-01, 003-SB-006-01, 003-SB-006-03 and 003-SB-P07-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Contract Required detection Limit (CRDL) Percent Recoveries (%Rs) for chromium, lead and mercury were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for arsenic were outside the 85-115% quality control limits and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-006-03, 003-SB-P07-01, 003-SB-P03-03, 003-SB-003-02, 003-SB-013-01, 003-SB-013-02, 003-BB-001-01, 003-BB-002-01 and 003-TW-P07-01. However, no validation actions were warranted as all results reported for arsenic in the affected samples were qualified as blank contamination.

The GFAA Post Digestion Spike Recoveries for selenium were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-006-01, 003-SB-P07-01, 003-SB-P03-01, 003-SB-P03-03, 003-SB-003-02, 003-SB-013-01 and 003-SB-013-02. However, no validation actions were warranted as all results reported for selenium in the affected samples were nondetects.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony, manganese and mercury affecting the soil matrix were outside the 75-125% quality control limits. The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for lead (sample 003-TW-003-01), selenium (samples 003-TW-006-01, 003-BB-002-01, 003-TW-P03-01, 003-TW-003-01 and 003-TW-013-01) and thallium (samples 003-TW-006-01, 003-TW-P03-01, 003-TW-003-01, 003-TW-013-01, 003-SB-006-01, 003-SB-006-03 and 003-SB-P07-01) were < 85% quality control limit.

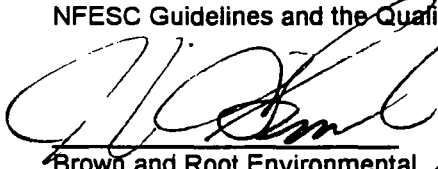
MEMO TO: M. SLADIC
DATE: OCTOBER 21, 1997 - PAGE 4

C-49-10-7-140

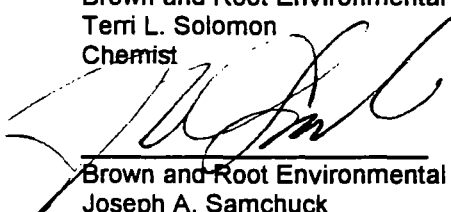
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review, September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF01

TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium	J ¹
antimony		J ³	manganese	J ²
arsenic	A ¹	J ¹	mercury	J ²
barium		J ¹	nickel	
beryllium			potassium	J ¹
cadmium			selenium	J ^{1,4,5}
calcium	A ¹	J ¹	silver	
chromium			sodium	A ¹ J ¹
cobalt	A ¹	J ¹	thallium	J ⁵
copper			vanadium	
iron		J ¹	zinc	J ¹
lead		J ⁵	cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of high MS %R affecting the soil matrix.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low MS %R affecting the soil matrix.
- J⁴ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R affecting the aqueous matrix.
- J⁵ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.



C-49-10-7-141

003-TW-003-F1 003-TW-006-F1 003-TW-013-F1 003-TW-P07-F1
003-TW-P03-F1

The attached Table 1 summarizes the validation recommendations which were based on the following information:

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DATE: OCTOBER 21, 1997 - PAGE 2

C-49-10-7-141

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	107.6 ug/L	538 ug/L
arsenic	1.9 ug/L	9.5 ug/L
barium	2.8 ug/L	14.0 ug/L
calcium ⁽¹⁾	92.900 ug/L	464.5 ug/L
cobalt	2.5 ug/L	12.5 ug/L
iron ⁽¹⁾	37.500 ug/L	187.5 ug/L
magnesium ⁽¹⁾	94.80 ug/L	474 ug/L
manganese	1.3 ug/L	6.5 ug/L
selenium	1.1 ug/L	5.5 ug/L
silver	3.5 ug/L	17.5 ug/L
sodium	82.5 ug/L	412.5 ug/L
vanadium	3.5 ug/L	17.5 ug/L
zinc ⁽¹⁾	7.200 ug/L	36.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for arsenic, cobalt, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese, selenium, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analyte were qualified as estimated, "J" and "UJ", respectively.

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for lead was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-006-F1, 003-TW-P07-F1, 003-TW-P03-F1, 003-TW-003-F1 and 003-TW-013-F1. The nondetected results reported for lead in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-006-F1, 003-TW-003-F1 and 003-TW-013-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-006-F1, 003-TW-P03-F1 and 003-TW-003-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: OCTOBER 21, 1997 - PAGE 3

C-49-10-7-141

Notes

The Contract Required detection Limit (CRDL) Percent Recovery (%R) for lead was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

Sample 003-TW-P07-F1 was analyzed for selenium by Method of Standard Addition.

Executive Summary

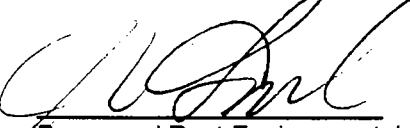
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

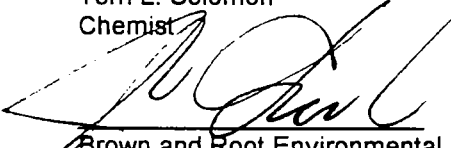
Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for lead (samples 003-TW-006-F1, 003-TW-P07-F1, 003-TW-P03-F1, 003-TW-003-F1 and 003-TW-013-F1), selenium (samples 003-TW-006-F1, 003-TW-003-F1 and 003-TW-013-F1) and thallium (samples 003-TW-006-F1, 003-TW-P03-F1 and 003-TW-003-F1) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF01

TABLE 1 - RECOMMENDATION SUMMARY

aluminum				magnesium	J ¹
antimony				manganese	J ¹
arsenic	A ¹			mercury	
barium		J ¹		nickel	
beryllium				potassium	
cadmium				selenium	J ^{1,2,3}
calcium		J ¹		silver	
chromium				sodium	J ¹
cobalt	A ¹			thallium	J ³
copper				vanadium	A ¹
iron		J ¹		zinc	A ¹ J ¹
lead		J ³			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-10-7-145

TO: M. SLADIC **DATE: OCTOBER 21, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

**SUBJECT: INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM, pH,
SPOT TEST FOR OXIDATION REDUCTION POTENTIAL, FERROUS IRON AND SULFIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF01**

SAMPLES: 4/Soils/

003-SB-006-01

003-SB-006-03

003-SB-013-01

003-SB-013-02

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF01, consists of four (4) soil environmental samples. No field duplicate pairs were included within this SDG.

Samples 003-SB-006-01 and 003-SB-006-03 were analyzed for total organic carbon. Sample 003-SB-013-01 was analyzed for hexavalent chromium, pH, oxidation reduction potential, ferrous iron and sulfide. Sample 003-SB-013-02 was analyzed for hexavalent chromium. The samples were collected by Brown and Root Environmental on July 8 and 1 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFES) Quality Assurance/Quality Control (QA/QC) criteria. Total Organic Carbon analyses were conducted using Lloyd, 1971 Method. Hexavalent Chromium analyses were conducted using SW-846 method 3060/7196. PH analyses were conducted using SW-846 method 9045.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: OCTOBER 21, 1997 - PAGE 2

C-49-11-7-001

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	13.8 mg/L	69 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary


Laboratory Performance: Total organic carbon was present in the laboratory method blank.

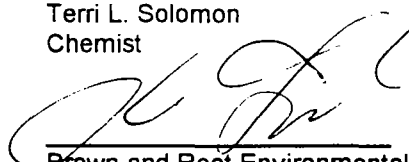
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: OCTOBER 21, 1997 - PAGE 3

C-49-11-7-001

NIROP FRIDLEY
SDG BRF01

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent chromium	
pH	
Oxidation reduction potential	
Ferrous iron	
Sulfide	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



C-49-10-7-220

TO:	M. SLADIC	DATE:	OCTOBER 31, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - DISSOLVED TAL METALS CTO 003 - NIROP FRIDLEY SDG - BRF02		
SAMPLES:	3/Aqueous/ 003-TW-004-F1 003-TW-008-F1 003-TW-038-F1		

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF02, consists of three (3) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for Dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on July 21, 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- " • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 2

C-49-10-7-220

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	107.6 ug/L	538 ug/L
barium	2.8 ug/L	14.0 ug/L
calcium ⁽¹⁾	92.900 ug/L	464.5 ug/L
cobalt	2.5 ug/L	12.5 ug/L
iron ⁽¹⁾	37.500 ug/L	187.5 ug/L
lead	1.5 ug/L	7.5 ug/L
magnesium ⁽¹⁾	94.80 ug/L	474 ug/L
manganese	1.2 ug/L	6.0 ug/L
silver	3.5 ug/L	17.5 ug/L
sodium	82.5 ug/L	412.5 ug/L
vanadium	3.5 ug/L	17.5 ug/L
zinc ⁽¹⁾	7.200 ug/L	36.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for cobalt, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, cobalt, iron, magnesium, manganese and sodium have been qualified as estimated, "J".

ICP Interference Check Sample Results

The interfering analyte calcium was present in sample 003-TW-004-F1 at a concentration which was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes namely antimony, barium, cadmium, cobalt, manganese, nickel and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, cobalt and nickel in the affected sample. The positive result reported for nickel and the nondetected result reported for antimony were qualified as estimated, "J" and "UJ", respectively. The positive result reported for cobalt received no validation flag as the result was qualified as blank contamination.

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analyte were qualified as estimated, "J" and "UJ", respectively.

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-004-F1 and 003-TW-038-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 3

C-49-10-7-220

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-008-F1, 003-TW-004-F1 and 003-TW-038-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

Sample 003-TW-008-F1 was analyzed for selenium by Method of Standard Addition.

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-038-F1. However, no validation actions were required as the result reported for arsenic in the affected samples was nondetected.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte calcium was present in sample 003-TW-004-F1. The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-004-F1 and 003-TW-038-F1) and thallium (samples 003-TW-008-F1, 003-TW-004-F1 and 003-TW-038-F1) were < 85% quality control limit.

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 4

C-49-10-7-220


The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review, September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
SDG BRF02

TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	J ¹
antimony	J ²		manganese	J ¹
arsenic			mercury	J ²
barium	J ¹		nickel	J ^{3,4}
beryllium			potassium	J ^{3,4}
cadmium			selenium	J ^{3,4}
calcium	J ¹		silver	J ¹
chromium			sodium	J ⁴
cobalt	A ¹	J ¹	thallium	J ⁴
copper			vanadium	A ¹
iron	J ¹		zinc	A ¹
lead				

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects, "J" and "UJ", respectively, as a result of ICP Interference.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J⁴ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.

TO: MR. MARK SLADIC **DATE: OCTOBER 13, 1997**
FROM: LINDA KARSONOVICH **COPIES: DV FILE**
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF02

SAMPLES: 7/Soil/

003-SB-008-01	003-SB-DP1-01
003-SB-008-02	003-SB-038-01
003-SB-004-01	003-SB-138-03
003-SB-004-03	

9/Aqueous/

003-SW-001-01	003-TW-004-01
003-SW-002-01	003-TW-038-01
003-TW-008-01	

003-TB-006-01	003-TB-008-01
003-TB-007-01	003-TB-009-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF02 consists of seven (7) solid environmental samples, five (5) aqueous environmental samples and four (4) field quality control blanks. The samples, with the exception of the trip blanks (designated -TB-), were analyzed for Target Compound List (TCL) volatile and semivolatile organic compounds. The environmental samples were also analyzed for PCBs. The trip blanks were analyzed for volatile compounds only. The field crew designated sample for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. The laboratory also analyzed blank spike samples. One field duplicate pair was included in this SDG (003-SB-004-01/003-SB-DP1-01).

The samples were collected by Brown and Root Environmental on July 16th, 21st, 22nd, and 23rd, 1997 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260 and CLP analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- Matrix Spike/Matrix Spike Duplicate Results
- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results reported in the affected samples were qualified as estimated, (J) and rejected, (UR).

The aqueous initial calibration contained a %RSD for acetone that exceeded the 30% criterion. Positive results in the associated samples have been qualified as estimated, (J).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for chloromethane, chloroethane, acetone, methylene chloride, 2-butanone, 1,2-dichloroethane, tetrachloroethene, and bromoform. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

Continuing calibration Response Factors (RFs) less than 0.05 were reported for acetone and 2-butanone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results reported for acetone and 2-butanone in the affected samples were qualified as estimated, (J) and rejected (UR).

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

Compound	Maximum Concentration	Action Level
Methylene Chloride	4 µg/kg	40 µg/kg
Acetone	5 µg/L	50 µg/L
Methylene Chloride	0.4 µg/L	4.0 µg/L
Samples affected:	All	

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

A high Percent Recovery (%R) was reported for the surrogate bromofluorobenzene in matrix spike duplicate 003-SB-DP1-01. No action was necessary since only one surrogate was noncompliant.

Dilution factors, percent solids and aliquots used for analysis were taken into consideration during the application of all action levels. Positive results reported for methylene chloride and acetone were qualified in the manner indicated by the blank action table. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Dilutions were performed on samples 003-TW-004-01 (5X) and 003-TW-038-01 (2X) as the compounds cis-1,2-dichloroethene and trichloroethene were above the linear range of the instrument. The results from the dilution for these two compounds (only) were transcribed over to the undiluted sample results.

A water sample was not designated for matrix spike/matrix spike duplicate analysis on the chain of custody sheets and was not performed for this SDG. The laboratory did perform blank spike/blank spike duplicate analysis for water.

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for pyridine, bis(2chloroisopropyl)ether, 2-nitroaniline, butylbenzylphthalate, 2-fluorophenol (surrogate), and 2,4,6-tribromophenol (surrogate). Positive and nondetected results reported for the aforementioned target compounds in the affected samples were qualified as estimated, (J) and (UJ).

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	26 µg/Kg	260 µg/Kg
Bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L

Samples affected: All soils and aqueous samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors and aliquots used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate were qualified in the manner indicated by the blank action table.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses of sample 003-SW-001-01 yielded high %Rs for 4-nitrophenol and low %Rs for acenaphthene. The positive result for acenaphthalene was qualified as estimated, (J).

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

Surrogate recovery of 2-fluorophenol for samples 003-SB-004-01, 003-SBDP1-01, 003-SB-038-01, and 003-SB-038-03 was calculated incorrectly. The recalculated recoveries were within the acceptance criteria and no further action was taken.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs and %Ds outside than their respective quality control limits were reported for several volatile and semivolatile compounds. Methylene chloride, acetone, and bis(2-ethylhexyl)phthalate were detected in the laboratory method blanks. The MS/MSD analyses of sample 003-SW-001-01 yielded high %Rs for 4-nitrophenol and low %Rs for acenaphthene. Several surrogate recoveries were incorrectly calculated.

Other Factors Affecting Data Quality: Methylene chloride was detected in the field quality control blanks. A high %R was reported for the surrogate bromofluorobenzene in sample 003-SB-DP1-01.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NWIROP FRIDLEY

SDG BRF02

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA	PCB
003-SW-001-01	J ⁶	R ¹		J ^{1,7}
003-SW-002-01		J ^{3,6}	R ¹	J ¹
003-TW-008-01	J ⁶	R ¹		J ^{2,6}
003-TW-004-01		R ¹	A ¹	J ^{2,6}
003-TW-038-01	J ⁶	R ¹	A ¹	J ¹
003-TB-006-01	A ¹	R ¹		
003-TB-007-01	A ¹	R ¹		
003-TB-008-01		R ¹		
003-TB-009-01	A ²	R ¹		
003-SB-008-01	A ²	J ^{5,6}	A ¹	J ¹
003-SB-008-02	A ²	J ⁴	A ¹	J ¹
003-SB-004-01	A ²	J ^{4,6}	A ¹	J ^{1,6}
003-SB-004-03	A ²	J ^{4,6}	A ¹	
003-SB-DP1-01	A ²	J ^{6,6}	A ¹	J ¹
003-SB-038-01	A ²	J ^{4,6}	A ¹	J ^{1,6}
003-SB-038-03	A ³	J ^{4,6}	A ¹	J ¹

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but replace positive results for methylene chloride with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A² - Accept data, but replace positive results for methylene chloride and acetone with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A³ - Accept data, but replace positive results for methylene chloride a revised detection limit and qualify as nondetected, (U) and qualify reported positive for acetone as estimated (J), as a result of laboratory method blank contamination.
- A⁴ - Accept data, but replace positive results for bis(2-ethylhexyl)phthalate with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- R¹ - Reject data, qualify nondetected results for acetone, and 2-butanone, as rejected, (UR) and qualify positive results as estimated, (J).
- J¹ - Accept data, but qualify positive and nondetected results for pyridine as estimated, (J) and (UJ), as a result of initial and/or continuing calibration %RSDs and %Ds greater than their respective quality control limits.
- J² - Accept data, but qualify positive and nondetected results for pyridine, bis(2-chloroisopropyl)ether, 2-nitroaniline, and butylbenzylphthalate as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than their respective quality control limits.
- J³ - Accept data, but qualify positive results for acetone, 2-butanone, and 2-hexanone as estimated, (J) and (UJ), as a result of initial and continuing calibration %RSD and/or continuing calibration %D greater than 30% and 25%, respectively.
- J⁴ - Accept data, but qualify positive and nondetected results for chloromethane, chloroethane, acetone, methylene chloride, 2-butanone, and 1,2-dichloroethane as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.

MEMO TO: MR. DAN HAMEL
DATE: JUNE 16, 1997 - PAGE 6

- J⁵ - Accept data, but qualify positive and nondetected results for acetone, methylene chloride, tetrachloroethene, and bromoform as estimated, (UJ), as a result of a continuing calibration %Ds greater than 25%.
- J⁶ - Accept data, but qualify positive results below the CRQL as estimated, (J).
- J⁷ - Accept data, but qualify positive result for acenaphthalene as estimated, (J), as a result of a low matrix spike recovery.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown(s) substituted benzene cyclotetrasiloxane, octamethyl- silanol, trimethyl- perfluorotributylamine
Semivolatile	Unknown(s) aldol condensate bromohydrocarbon organic acid bromacil benzamide, n-propyl 1,3-dioxolane, 2,4-dimethyl-2-phthalate cyclotetrasiloxane, octamethyl cyclopentasiloxane, decamethyl cyclohexasiloxane, dodecamethyl PAH hydrocarbon



C-49-10-7-215

TO: M. SLADIC **DATE: OCTOBER 31, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF02

SAMPLES:	7/Soils/			
	003-SB-004-01	003-SB-004-03	003-SB-008-01	003-SB-008-02
	003-SB-038-01	003-SB-038-03	003-SB-DP1-01	
	5/Aqueous/			
	003-SW-001-01	003-SW-002-01	003-TW-004-01	003-TW-008-01
	003-TW-038-01			

The sample set for CTO 003, NIROP Fridley, SDG BRF02, consists of seven (7) soil environmental samples and five (5) aqueous environmental samples. One (1) field duplicate pair (003-SB-004-01 / 003-SB-DP1-01) was included within this SDG.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- Field Duplicate Results
- ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 2

C-49-10-7-215

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	41.7 ug/L	NA	41.7 mg/kg
aluminum ⁽²⁾	107.6 ug/L	538 ug/L	NA
barium	3.2 ug/L	16.0 ug/L	3.2 mg/kg
calcium	46.3 ug/L	NA	46.3 mg/kg
calcium ⁽²⁾	92.90 ug/L	464.5 ug/L	NA
cobalt	2.5 ug/L	12.5 ug/L	2.5 mg/kg
copper ⁽¹⁾	0.640 mg/kg	NA	3.2 mg/kg
iron	18.0 ug/L	NA	18.0 mg/kg
iron ⁽²⁾	37.500 ug/L	187.5 ug/L	NA
lead	1.5 ug/L	7.5 ug/L	1.5 mg/kg
magnesium	52.7 ug/L	NA	52.7 mg/kg
magnesium ⁽²⁾	94.800 ug/L	474 ug/L	NA
manganese	1.3 ug/L	6.5 ug/L	1.3 mg/kg
potassium	136.7 ug/L	683.5 ug/L	136.7 mg/kg
silver	3.5 ug/L	17.5 ug/L	3.5 mg/kg
sodium	82.5 ug/L	412.5 ug/L	82.5 mg/kg
thallium	1.3 ug/L	6.5 ug/L	1.3 mg/kg
vanadium	3.5 ug/L	17.5 ug/L	3.5 mg/kg
zinc ⁽¹⁾	2.320 mg/kg	NA	11.6 mg/kg
zinc ⁽²⁾	7.200 ug/L	36.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, calcium, cobalt, copper, iron, lead, sodium, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, thallium, vanadium and zinc have been qualified as estimated, "J".

ICP Interference Check Sample Results

The interfering analyte calcium was present in sample 003-SB-038-03 at a concentration which was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes namely antimony, barium, cobalt, manganese, sodium and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony and cobalt in the affected sample. The positive result reported for cobalt and the nondetected result reported for antimony were qualified as estimated, "J" and "UJ" respectively.

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 3

C-49-10-7-215

The interfering analyte calcium was present in sample 003-TW-004-01 at a concentration which was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes namely antimony, barium, cadmium, cobalt, manganese, nickel and zinc were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, cobalt and nickel in the affected sample. The positive result reported for nickel and the nondetected result reported for antimony were qualified as estimated, "J" and "UJ", respectively. The positive result reported for cobalt received no validation flag as the result was qualified as blank contamination.

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and selenium affecting the soil matrix were < 75% quality control limit. Positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %R for lead affecting the soil matrix was < 30% quality control limit. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

The MS %R for cyanide affecting the aqueous matrix was < 75% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for lead affecting the soil matrix. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

Field Duplicate Results

Field duplicate imprecision was noted for soil sample pair 003-SB-004-01 / 003-SB-DP1-01 for lead. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for zinc affecting the soil matrix was greater than the 10% quality control limit. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

The ICP Serial Dilution %D for zinc affecting the aqueous matrix was greater than the 10% quality control limit. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SW-002-01. The nondetected result reported for arsenic in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for lead were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SW-002-01, 003-TW-008-01 and 003-TW-004-01. The nondetected results reported for lead in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-004-01, 003-TW-038-01, 003-SB-DP1-01, 003-SB-004-03, 003-SB-008-02, 003-SB-038-01, 003-SB-038-03 and 003-SB-008-01. The positive results and nondetects reported for selenium in the affected samples were qualified as estimated, "J" and "UJ", respectively.

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The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SW-001-01, 003-TW-008-01, 003-TW-004-01 and 003-TW-038-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

Sample 003-TW-008-01 was analyzed for selenium by method of standard addition.

The Contract Required detection Limit (CRDL) Percent Recoveries (%Rs) for mercury and zinc were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for lead were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SW-001-01 and 003-TW-038-01. However, no validation actions were warranted as all results reported for arsenic in the affected samples were qualified as blank contamination.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte calcium was present in samples 003-SB-038-03 and 003-TW-004-01. The MS %Rs for antimony and selenium affecting the soil matrix were < 75% quality control limits. The MS %R for lead affecting the soil matrix was < 30% quality control limit. The MS %R for cyanide affecting the aqueous matrix was < 75% quality control limit. Laboratory duplicate imprecision was noted for lead affecting the soil matrix. Field duplicate imprecision was noted for lead affecting the soil matrix. The ICP Serial Dilution %Ds for zinc affecting the aqueous and soil matrix were greater than the 10% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (003-SW-002-01), lead (samples 003-SW-002-01, 003-TW-008-01 and 003-TW-004-01), selenium (samples 003-TW-004-01, 003-TW-038-01, 003-SB-DP1-01, 003-SB-004-03, 003-SB-008-02, 003-SB-038-01, 003-SB-038-03 and 003-SB-008-01) and thallium (samples 003-SW-001-01, 003-TW-008-01, 003-TW-004-01 and 003-TW-038-01) were < 85% quality control limit.

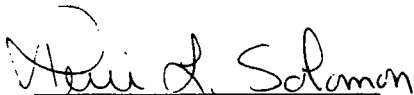
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C-49-10-7-215

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review, September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: OCTOBER 31, 1997 - PAGE 6

C-49-10-7-215

NIROP FRIDLEY
SDG BRF02

TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium	J ¹
antimony		J ^{2,3}	manganese	J ¹
arsenic		J ⁹	mercury	
barium		J ¹	nickel	J ²
beryllium			potassium	J ¹
cadmium			selenium	J ^{3,9}
calcium	A ¹	J ¹	silver	
chromium			sodium	A ¹ J ¹
cobalt	A ¹	J ^{1,2}	thallium	A ¹ J ^{1,9}
copper	A ¹	J ¹	vanadium	A ¹ J ¹
iron	A ¹	J ¹	zinc	A ¹ J ^{1,8}
lead	A ¹	J ^{1,4,6,7,9}	cyanide	J ⁵

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of ICP Interference.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R affecting the soil matrix.
- J⁴ - Accept data but qualify positive results as estimated, "J", as a result of extremely low MS %R affecting the soil matrix.
- J⁵ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low MS %R affecting the aqueous matrix.
- J⁶ - Accept data but qualify positive results as estimated, "J", as a result of laboratory duplicate imprecision affecting the soil matrix.
- J⁷ - Accept data but qualify positive results as estimated, "J", as a result of field duplicate imprecision affecting the soil matrix.
- J⁸ - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D > 10% affecting the soil and aqueous matrix.
- J⁹ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low GFAA Post Digestion Spike Recoveries.

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-001

TO: M. SLADIC **DATE: NOVEMBER 3, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

**SUBJECT: INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM
CTO 003 - NIROP FRIDLEY
SDG - BRF02**

SAMPLES: 5/Soils/

003-SB-004-01 003-SB-004-03 003-SB-008-01 003-SB-008-02
003-SB-DP1-01

4/Aqueous/

003-BB-001-01 003-BB-002-01 003-SW-001-01 003-SW-002-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF02, consists of five (5) soil environmental samples and four (4) aqueous environmental samples . One (1) field duplicate pair (003-SB-004-01 / 003-SB-DP1-01) was included within this SDG.

All samples were analyzed for hexavalent chromium. Samples 003-SB-004-01, 003-SB-004-03 and 003-SB-DP1-01 were also analyzed for total organic carbon. The samples were collected by Brown and Root Environmental on July 16, 21 and 22, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

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DATE: NOVEMBER 3, 1997 - PAGE 2

C-49-11-7-001

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	8 mg/L	40 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary


Laboratory Performance: Total organic carbon was present in the laboratory method blank.

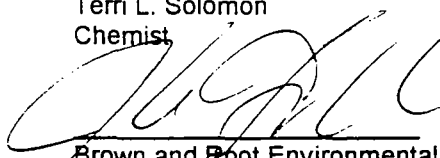
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review, September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 3, 1997 - PAGE 3

C-49-11-7-001

NIROP FRIDLEY
SDG BRF02

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
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If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".

APPENDIX A
Qualified Analytical Results

CTO003 - NIROP FRIDLEY
 SOIL DATA
 LAUCKS
 SDG: BRF02

Page 1

SAMPLE NUMBER:	003-SB-004-01	003-SB-DP1-01	003-SB-004-03	003-SB-008-01	003-SB-008-02
SAMPLE DATE:	07/22/97	07/22/97	07/22/97	07/21/97	07/21/97
LABORATORY ID:	9707721-02	9707721-05	9707721-04	9707682-02	9707682-03
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	97.4 %	97.2 %	98.7 %	98.4 %	98.2 %
FIELD DUPLICATE OF:		003-SB-004-01			
RESULT QUAL UNITS		RESULT QUAL UNITS	RESULT QUAL UNITS	RESULT QUAL UNITS	RESULT QUAL UNITS
CHROMIUM, HEXVALENT	2.0 U MG/KG	2.0 U MG/KG	2.0 U MG/KG	2.0 U MG/KG	2.0 U MG/KG
GENERAL CHEMISTRY					
TOTAL ORGANIC CARBON	1800 J MG/KG	1500 J MG/KG	2200 J MG/KG		

CTO003 - NIROP FRIDLEY
 WATER DATA
 LAUCKS
 SDG: BRF02

SAMPLE NUMBER:	003-BB-001-01	003-BB-002-01	003-SW-001-01	003-SW-002-01	
SAMPLE DATE:	07/16/97	07/16/97	07/16/97	07/16/97	/ /
LABORATORY ID:	9707513-04	9707513-05	9707513-02	9707513-03	
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL	
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %	100.0 %
FIELD DUPLICATE OF:					

	RESULT	QUAL	UNITS	RESULT	QUAL	UNITS	RESULT	QUAL	UNITS	RESULT	QUAL	UNITS	RESULT	QUAL	UNITS
--	--------	------	-------	--------	------	-------	--------	------	-------	--------	------	-------	--------	------	-------

CHROMIUM, HEXAVALENT	0.005		U MG/L	0.005		U MG/L	0.005		U MG/L	0.005		U MG/L			
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C-49-11-7-062

TO: M. SLADIC **DATE: NOVEMBER 10, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF03

SAMPLES:	7/Soils/			
	003-SB-016-01	003-SB-016-03	003-SB-017-01	003-SB-017-03
	003-SB-018-01	003-SB-073-01	003-SB-073-03	
	6/Aqueous/			
	003-AB-001-01	003-BB-003-01	003-TW-016-01	003-TW-017-01
	003-TW-073-01	003-TW-DP1-01		

The sample set for CTO 003, NIROP Fridley, SDG BRF03, consists of seven (7) soil environmental samples and six (6) aqueous environmental samples. One (1) field duplicate pair (003-TW-073-01 / 003-TW-DP1-01) was included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on July 24, 25 and 26, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- * • Field Duplicate Results
- ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results

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C-49-11-7-062

- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	24.7 ug/L	123.5 ug/L	NA
aluminum ⁽¹⁾	8.300 mg/kg	NA	41.5 mg/kg
barium	3.3 ug/L	16.5 ug/L	3.3 mg/kg
beryllium	0.3 ug/L	1.5 ug/L	0.3 mg/kg
calcium	51.7 ug/L	258.5 ug/L	51.7 mg/kg
copper ⁽¹⁾	0.640 mg/kg	NA	3.2 mg/kg
iron	5.9 ug/L	29.5 ug/L	5.9 mg/kg
magnesium	57.8 ug/L	289 ug/L	57.8 mg/kg
manganese	2.1 ug/L	10.5 ug/L	2.1 mg/kg
nickel	4.6 ug/L	23.0 ug/L	4.6 mg/kg
potassium	209.6 ug/L	1048 ug/L	209.6 mg/kg
selenium	1.0 ug/L	5.0 ug/L	1.0 mg/kg
sodium	48.6 ug/L	243 ug/L	48.6 mg/kg
thallium	1.3 ug/L	6.5 ug/L	1.3 mg/kg
vanadium	2.7 ug/L	13.5 ug/L	2.7 mg/kg
zinc ⁽¹⁾	2.320 mg/kg	NA	11.6 mg/kg
zinc ⁽²⁾	6.900 ug/L	34.5 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, barium, beryllium, calcium, copper, nickel, sodium, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, copper, iron, magnesium, manganese, nickel, potassium, sodium, vanadium and zinc have been qualified as estimated, "J".

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DATE: NOVEMBER 10, 1997 - PAGE 3

C-49-11-7-062

ICP Interference Check Sample Results

The interfering analyte iron was present in sample 003-SB-017-01 at a concentration which was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes namely antimony, barium, cadmium, cobalt, manganese and silver were present in the ICS solution at concentrations which exceeded the Instrument Detection Limit (IDL). Interference affects exist for antimony, cobalt and silver in the affected sample. The positive results and nondetects reported for antimony, cobalt and silver were qualified as estimated, "J" and "UJ", respectively.

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and selenium affecting the soil matrix were < 75% quality control limit. Positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %R for copper affecting the soil matrix was < 30% quality control limit. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

The MS %R for arsenic affecting the soil matrix was > 125% quality control limit. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for copper, iron and lead affecting the soil matrix. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Differences (%Ds) for iron and zinc affecting the soil matrix were greater than the 10% quality control limit. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for arsenic were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-016-01 and 003-BB-003-01. The positive result reported for arsenic in sample 003-TW-016-01 was qualified as estimated, "J". The nondetected result reported for arsenic in sample 003-BB-003-01 was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-073-01, 003-SB-073-03, 003-SB-017-01, 003-SB-016-03, 003-TW-017-01, 003-TW-DP1-01 and 003-TW-016-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recovery for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-073-01. The nondetected result reported for selenium in the affected sample was qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: NOVEMBER 10, 1997 - PAGE 4

C-49-11-7-062

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury and zinc were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The interfering analyte iron was present in sample 003-SB-017-01. The MS %Rs for antimony and selenium affecting the soil matrix were < 75% quality control limits. The MS %R for copper affecting the soil matrix was < 30% quality control limit. The MS %R for arsenic affecting the soils matrix was > 125% quality control limit. Laboratory duplicate imprecision was noted for copper, iron and lead affecting the soil matrix. The ICP Serial Dilution %Ds for iron and zinc affecting the soil matrix were greater than the 10% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (samples 003-TW-016-01 and 003-BB-003-01), selenium (samples 003-SB-073-01, 003-SB-073-03, 003-SB-017-01, 003-SB-016-03, 003-TW-017-01, 003-TW-DP1-01 and 003-TW-016-01) and thallium (sample 003-TW-073-01) were < 85% quality control limit.

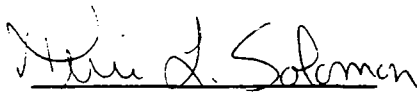
MEMO TO: M. SLADIC
DATE: NOVEMBER 10, 1997 - PAGE 5

C-49-11-7-062

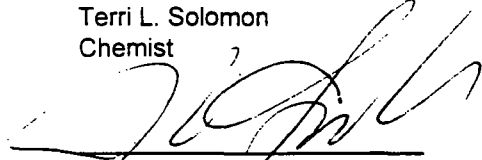
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
SDG BRF03

TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium		
antimony		J ^{2,3}	manganese		
arsenic		J ^{5,8}	mercury		
barium	A ¹	J ¹	nickel	A ¹	J ¹
beryllium	A ¹		potassium		
cadmium			selenium		J ^{3,8}
calcium	A ¹	J ¹	silver		J ²
chromium			sodium	A ¹	J ¹
cobalt		J ²	thallium	A ¹	J ⁸
copper	A ¹	J ^{1,4,6}	vanadium	A ¹	J ¹
iron		J ^{6,7}	zinc	A ¹	J ^{1,7}
lead		J ⁶	cyanide		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of ICP Interference.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R affecting the soil matrix.
- J⁴ - Accept data but qualify positive results as estimated, "J", as a result of extremely low MS %R affecting the soil matrix.
- J⁵ - Accept data but qualify positive results as estimated, "J", as a result of high MS %R affecting the soil matrix.
- J⁶ - Accept data but qualify positive results as estimated, "J", as a result of laboratory duplicate imprecision affecting the soil matrix.
- J⁷ - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D > 10% affecting the soil matrix.
- J⁸ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low GFAA Post Digestion Spike Recoveries.



C-49-11-7-065

DATE: NOVEMBER 11, 1997

COPIES: DV FILE

SAMPLES: 5/Soils/

003-SB-017-03

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 11, 1997 - PAGE 2

C-49-11-7-065

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	10 mg/L	50 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

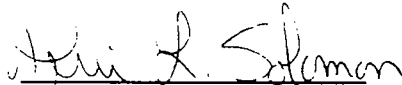
Laboratory Performance: Total organic carbon was present in the laboratory method blank.

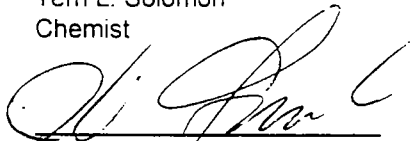
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 11, 1997 - PAGE 3

C-49-11-7-065

NIROP FRIDLEY
SDG BRF03

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
----------------------	----------------

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



C-49-11-7-065

SAMPLES: 4/Aqueous/

003-TW-016-F1 003-TW-017-F1 003-TW-073-F1 003-TW-DP1-F1

The sample set for CTO 003, NIROP Fridley, SDG BRF03^D, consists of four (3) aqueous environmental samples. One (1) field duplicate pair (003-TW-073-F1 / 003-TW-DP1-F1) was included within this SDG.

All analyses, with the exception of arsenic, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
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C-49-11-7-065

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
barium	2.8 ug/L	14.0 ug/L
beryllium	0.3 ug/L	1.5 ug/L
calcium	50.2 ug/L	251 ug/L
iron	5.9 ug/L	29.5 ug/L
magnesium	36.9 ug/L	184.5 ug/L
manganese	1.1 ug/L	5.5 ug/L
nickel	4.6 ug/L	23.0 ug/L
selenium	1.0 ug/L	5.0 ug/L
sodium	48.6 ug/L	243 ug/L
thallium ⁽¹⁾	1.2 ug/L	6.0 ug/L
vanadium	2.5 ug/L	12.5 ug/L
zinc ⁽¹⁾	6.90 ug/L	34.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for beryllium, nickel, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese, nickel and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Nondetected results reported for the aforementioned analyte were qualified as estimated, "UJ".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-073-F1, 003-TW-DP1-F1, 003-TW-017-F1 and 003-TW-016-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for lead was > 120% quality control limit. However, no validation actions are required for this noncompliance.

MEMO TO: M. SLADIC
DATE: NOVEMBER 11, 1997 - PAGE 3

C-49-11-7-065

Executive Summary

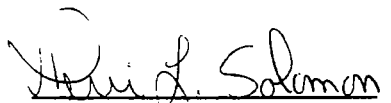
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

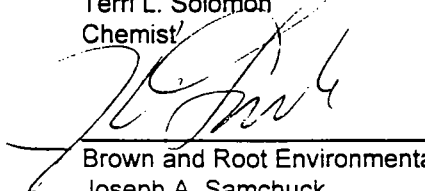
Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-073-F1, 003-TW-DP1-F1, 003-TW-017-F1 and 003-TW-016-F1) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF03

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹	
antimony		manganese	J ¹	
arsenic		mercury		
barium	J ¹	nickel	A ¹	J ¹
beryllium	A ¹	potassium		
cadmium		selenium		J ^{2,3}
calcium	J ¹	silver		
chromium		sodium		J ¹
cobalt		thallium		
copper		vanadium	A ¹	
iron	J ¹	zinc	A ¹	
lead				

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", as a result of low MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.

C-49-10-7-082

TO: MR. MARK SLADIC **DATE: NOVEMBER 13, 1997**
FROM: PAMELA A. KORYAK **COPIES: DV FILE**
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB ORGANICS
CTO 003 NIROP FRIDLEY
SDG BRF03

SAMPLES: 7/Solid/

003-SB018-01	003-SB016-03	003-SB016-01
003-SB017-03	003-SB017-01	003-SB073-03
003-SB073-01		

8/Aqueous/

003-BB003-01	003-AB001-01	003-TW016-01
003-TW017-01	003-TB011-01	003-TWDP1-01
003-TW073-01	003-TB01-001	

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF03 consists of seven (7) solid environmental samples and six (6) aqueous environmental samples and two (2) trip blanks. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB organic compounds), with the exception of the trip blanks which were analyzed for volatile organic compounds only. Two samples (003-SB017-03 and 003-TW073-01) were designated for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses by the field crew. The field duplicate pair (003-TWDP1-01/003-TW073-01) was included in this SDG.

The samples were collected by Brown and Root Environmental on July 24th, 25th, and 26th, 1997 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Test Methods for Evaluating Solid Wastes, SW-846 Method 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial and continuing calibrations
- Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- * • Matrix Spike/Matrix Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits

MEMO TO: MR. MARK SLADIC
 DATE: NOVEMBER 13, 1997 - PAGE 2

- * • Field duplicate precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

The following table summarizes the maximum concentration of volatile compounds detected in the method quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene chloride	0.5 µg/L	5 µg/L
Acetone	5 µg/kg	50 µg/kg
Methylene chloride	2 µg/kg	20 µg/kg

Samples affected: All

Blank Actions:

- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Results reported for methylene chloride in the affected samples were qualified in the manner indicated by the blank action table.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone and 2-butanone were less than 0.05. The nondetects were qualified as rejected, UR, and the positive results were qualified as estimated, J.

The continuing Relative Response Factor (RRF) for 2-hexanone was less than 0.05. Only nondetected results were reported for this compound and these results were qualified as rejected, UR.

The initial calibration Percent Relative Standard Deviation (%RSD) was greater than 30% for acetone. This compound in the affected samples was qualified as estimated, J.

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for acetone, chlormethane, chloroethane, methylene chloride, 2-butanone, tetrachlorethene, bromoform, and 1,2-dichloroethane. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results for the aforementioned compounds were qualified as estimated, J and UJ, respectively.

The Relative Percent Difference (RPD) for 1,1-dichloroethene in the duplicate pair (003TW07301 and 003TWDP101) exceeded 30%. This compound was qualified as estimated, J, in the affected samples.

Samples 003TW01601, 003TW01701, 003TW07301, and 003TWDP101 were reanalyzed at a dilution due to cis-1,2-dichloroethene and trichloroethene exceeding the instrument linear calibration range. The original analyses were chosen for validation. The dilution results for these compounds were transposed over the original sample results and used in the validation of this SDG. In addition, 1,1,-dichloroethane exceeded the linear calibration range in sample 003TW01701 and the dilution result was transposed over the original result and used in validation of this SDG.

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It should be noted that the instrument mass tuning compound FC43(perfluorotributylamine) was reported as a TIC in a volatile organic sample. This compound is not considered to be a TIC in the environmental sample by the data reviewer.

Semivolatiles

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L
Bis 2-ethylhexyl)phthalate	26 ug/kg	260 ug/kg
Samples Affected:	All.	

Blank Actions:

- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors, percent moisture, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for this compound in the affected samples were qualified in the manner indicated by the blank action table.

The continuing calibration %Ds were greater than 25% for pyridine, 2-nitroaniline, 3-nitroaniline, 4-nitrophenol, 4-nitroaniline, 3,3'-dichlorobenzidine, carbazole, bis(2-chloroisopropyl)ether, and butylphthalate. Only nondetected results were reported for the aforementioned compounds in the affected samples and these results were qualified as estimated, (UJ).

Sample 003SB01701 was reanalyzed at a dilution due to benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene exceeding the instrument linear calibration range. The original analysis was chosen for validation. The dilution results for the aforementioned compounds were transposed over the original result and used in the validation of this SDG.

Positive results reported at concentrations below the CRQL were qualified as estimated, (J).

PCBs

The initial calibration %RSD was greater than 20% for Aroclor-1016 for one peak only, therefore no action was taken.

EXECUTIVE SUMMARY


Laboratory Performance Issues: Contamination was observed in the volatile and semivolatile fractions in the method blanks. Initial and continuing calibration Relative Response Factors were less than 0.05 for the volatile fraction. Continuing calibration %Ds greater than the 25% quality control limit were reported for several volatile and semivolatile compounds.

Other Factors Affecting Data Quality: Some positive results were reported at concentrations below the CRQL in the volatile and semivolatile fractions.


The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (8/93), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 13, 1997 - PAGE 4

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Pamela A. Koryak
Risk Assessor/Data Validator



Brown and Root Environmental
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF03

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PCB
003-SB018-01	A ^{1,2} J ^{1,2,8}	A ³ J ⁷	
003-BB003-01	R ¹ J ^{4,8,9}	A ³	
003-AB001-01	R ¹ J ^{8,9}	A ³ J ⁵	
003-TW016-01	R ¹ J ⁸	A ³ J ⁵	
003-SB016-03	A ^{1,2} J ^{3,8}	A ³ J ⁵	
003-SB016-01	A ^{1,2} J ^{1,8}	A ³ J ⁵	
003-TW017-01	R ¹ J ^{8,9}	A ³ J ⁶	
003-SB017-03	A ^{1,2} J ^{1,2,3,8}	A ³ J ^{7,8}	
003-SB017-01	A ^{1,2} J ^{1,2,3,8}	A ³ J ^{5,8}	
003-TB011-01	A ² R ¹		
003-TWDP1-01	R ¹	A ³ J ⁵	
003-TW073-01	R ¹	A ³ J ⁴	
003-SB073-03	A ^{1,2} J ^{1,2,8}	A ³ J ⁵	
003-SB073-01	A ^{1,2} J ^{1,2,8}	A ³ J ^{5,8}	
003-TB010-01	A ² R ¹		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, qualify positive results for acetone as nondetected, (U), due to method quality control blank contamination less than the action level.
- A² - Accept data, qualify positive results for methylene chloride as nondetected, (U), due to method quality control blank contamination.
- A³ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), due to method quality control contamination greater than the action level.
- R¹ - Reject data, qualify nondetected results as (UR) for acetone, 2-butanone, and/or 2-hexanone due to the Relative Response Factor less than 0.05.
- J¹ - Accept data, but qualify positive results for acetone, methylene chloride, and 2-butanone as estimated, (J), as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, qualify nondetected results for chloromethane, chloroethane, 1,2-dichloroethane, tetrachloroethene, and bromoform as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for tetrachloroethene and bromoform as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify nondetected results for pyridine, bis(2-chloroisopropyl)ether, 2-nitroaniline, and butylbenzyl phthalate as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁵ - Accept data, but qualify nondetected results for pyridine as estimated (UJ), due to continuing calibration %Ds greater than 25%.
- J⁶ - Accept data, but qualify nondetected results for pyridine, 3-nitroaniline, 4-nitrophenol, 4-nitroaniline, and 3,3'-dichlorobenzidine as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.

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- J⁷ - Accept data, but qualify nondetected results for pyridine, 4-nitroaniline, and carbazole as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁸ - Accept data, but qualify positive results less than the CRQL as estimated (J).
- J⁹ - Accept data, but qualify positive results as estimated, (J), due to initial and continuing calibration RRFs less than 0.05.

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Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	None
Semivolatile	Unknown(s) Unknown alkane(s) Unknown PAH(s) Unknown phthalate(s) Unknown organic acid Unknown hydrocarbon(s) Acetophenone



C-49-11-7-079

TO: M. SLADIC DATE: NOVEMBER 13, 1997

FROM: TERRI L. SOLOMON COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF04

SAMPLES:	10/Soils/			
	003-SB-018-02	003-SB-034-01	003-SB-034-03	003-SB-035-01
	003-SB-035-02	003-SB-054-01	003-SB-054-02	003-SB-074-01
	003-SB-074-03	003-SB-DP1-02		
	5/Aqueous/			
	003-TW-018-01	003-TW-034-01	003-TW-035-01	003-W-054-01
	003-TW-074-01			

The sample set for CTO 003, NIROP Fridley, SDG BRF04, consists of ten (10) soil environmental samples and five (5) aqueous environmental samples. One (1) field duplicate pair (003-SB-074-01 / 003-SB-DP1-02) was included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on July 26, 27, 28, 29 and August 4, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- * • Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results

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C-49-11-7-079

- GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum ⁽¹⁾	26.00 ug/L	130 ug/L	NA
arsenic	1.2 ug/L	6.0 ug/L	1.2 mg/kg
barium	3.5 ug/L	17.5 ug/L	3.5 mg/kg
beryllium	0.3 ug/L	1.5 ug/L	NA
beryllium ⁽²⁾	0.080 mg/kg	NA	0.400 mg/kg
calcium	51.7 ug/L	258.5 ug/L	51.7 mg/kg
cobalt	3.0 ug/L	15.0 ug/L	3.0 mg/kg
iron	7.3 ug/L	NA	7.3 mg/kg
iron ⁽¹⁾	36.500 ug/L	182.5 ug/L	NA
magnesium	57.8 ug/L	289 ug/L	57.8 mg/kg
manganese	2.7 ug/L	13.5 ug/L	2.7 mg/kg
nickel	4.3 ug/L	21.5 ug/L	4.3 mg/kg
potassium	209.6 ug/L	1048 ug/L	209.6 mg/kg
selenium	1.0 ug/L	5.0 ug/L	1.0 mg/kg
sodium	41.0 ug/L	205 ug/L	41.0 mg/kg
thallium	1.1 ug/L	5.5 ug/L	1.1 mg/kg
zinc ⁽¹⁾	6.700 ug/L	33.5 ug/L	NA
zinc ⁽²⁾	1.700 mg/kg	NA	8.50 mg/kg

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

⁽²⁾ Maximum concentration present in a soil preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for arsenic, beryllium, cobalt, thallium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, arsenic, barium, beryllium, calcium, cobalt, iron, magnesium, manganese, nickel, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

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DATE: NOVEMBER 13, 1997 - PAGE 3

C-49-11-7-079

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and selenium affecting the soil matrix were < 30% quality control limit. Nondetected results reported for the aforementioned analytes were qualified as rejected, "UR".

The MS %R for thallium affecting the soil matrix was < 75% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

The MS %R for selenium and thallium affecting the aqueous matrix was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for calcium and magnesium affecting the soil matrix. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

Laboratory duplicate imprecision was noted for aluminum affecting the aqueous matrix. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-018-01 and 003-TW-074-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-035-01, 003-TW-034-01 and 003-TW-054-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for chromium, lead and selenium were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for arsenic were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-018-01, 003-TW-074-01, 003-TW-035-01, 003-TW-034-01 and 003-TW-054-01. However, no validation actions were warranted as the results reported in the affected samples were either nondetects or were qualified as blank contamination.

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-018-01, 003-TW-074-01, 003-SB-018-02, 003-SB-074-01, 003-SB-DP1-02, 003-SB-074-03, 003-SB-035-01, 003-SB-035-02, 003-SB-034-03, 003-SB-054-02, 003-SB-034-01 and 003-SB-054-01. However, no validation actions were warranted as the nondetected results reported in the affected samples were rejected for a more severe noncompliance.

MEMO TO: M. SLADIC
DATE: NOVEMBER 13, 1997 - PAGE 4

C-49-11-7-079

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-074-01. However, no validation actions were warranted as the result reported in the affected sample was qualified as blank contamination.

The GFAA Post Digestion Spike Recovery for thallium was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-035-02. However, no validation actions were warranted as the result reported in the affected sample was nondetected.

Executive Summary

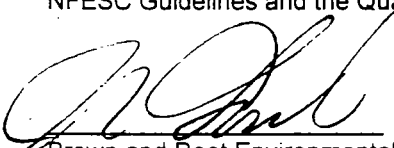
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.


Other Factors Affecting Data Quality: The MS %Rs for antimony and selenium affecting the soil matrix were < 30% quality control limits. The MS %R for thallium affecting the soil matrix was < 75% quality control limit. The MS %Rs for selenium and thallium affecting the aqueous matrix were < 75% quality control limit. Laboratory duplicate imprecision was noted for calcium and magnesium affecting the soil matrix. Laboratory duplicate imprecision was noted for aluminum affecting the aqueous matrix. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-018-01 and 003-TW-074-01) and thallium (samples 003-TW-035-01, 003-TW-034-01 and 003-TW-054-01) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1994 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96)

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
SDG BRF04

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		J ^{1,5}		magnesium		J ^{1,4}	
antimony			R ¹	manganese		J ¹	
arsenic	A ¹	J ¹		mercury			
barium		J ¹		nickel		J ¹	
beryllium	A ¹			potassium		J ¹	
cadmium				selenium		J ^{1,3,6}	R ¹
calcium		J ^{1,4}		silver			
chromium				sodium		J ¹	
cobalt	A ¹	J ¹		thallium	A ¹	J ^{2,3,6}	
copper				vanadium			
iron		J ¹		zinc	A ¹	J ¹	
lead				cyanide			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", respectively, as a result of low MS %R affecting the soil matrix.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R affecting the aqueous matrix.
- J⁴ - Accept data but qualify positive results as estimated, "J", as a result of laboratory duplicate imprecision affecting the soil matrix.
- J⁵ - Accept data but qualify positive results as estimated, "J", as a result of laboratory duplicate imprecision affecting the aqueous matrix.
- J⁶ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results, "UR", as a result of MS %R < 30% affecting the soil matrix.

C-49-10-7-115

TO: MR. MARK SLADIC DATE: NOVEMBER 17, 1997
FROM: PAMELA A. KORYAK COPIES: DV FILE
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
 CTO 003 NIROP FRIDLEY
 SDG BRF04

SAMPLES: 10/Solid/

003-SB018-02	003-SB034-01	003-SB034-03
003-SB035-01	003-SB035-02	003-SB054-01
003-SB054-02	003-SB074-01	003-SB074-03
003-SBDP1-02		

9/Aqueous/

003-TB012-01	003-TB013-01	003-TB014-01
003-TB015-01	003-TW018-01	003-TW034-01
003-TW035-01	003-TW054-01	003-TW074-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF04 consists of ten (10) solid environmental samples and five (5) aqueous environmental samples and four (4) trip blanks. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB organic compounds), with the exception of the trip blanks which were analyzed for volatile organic compounds only. Sample 003-SB035-01 was designated for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis by the field crew and sample 003-TW034-01 was designated by the laboratory for MS/MSD analysis. The field duplicate pair (003-SBDP1-02/003-SB074-01) was included in this SDG.

The samples were collected by Brown and Root Environmental on July 27th, 28th, 29th and August 4th, 1997 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Test Methods for Evaluating Solid Wastes, SW-846 Method 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- Holding times
- * • GC/MS tuning and system performance
- Initial and continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- Matrix Spike/Matrix Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound quantitation

- * • Detection limits
- * • Field duplicate precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

The following table summarizes the maximum concentration of volatile compounds detected in the method quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene chloride	0.5 µg/L	5 µg/L
Acetone	5 µg/kg	50 µg/kg
Methylene chloride	3 µg/kg	30 µg/kg

Samples affected: All

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Results reported for methylene chloride and acetone in the affected samples were qualified in the manner indicated by the blank action table.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone and 2-butanone were less than 0.05. Only nondetects were reported and these results were qualified as rejected, UR.

The continuing Relative Response Factor (RRF) for 2-hexanone was less than 0.05. Only nondetected results were reported for this compound and these results were qualified as rejected, UR.

The initial calibration Percent Relative Standard Deviation (%RSD) was greater than 30% for acetone. Positive and nondetects are affected by this noncompliance. This compound in the affected samples was qualified as estimated, J and UJ, respectively.

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for acetone, methylene chloride, tetrachloroethene, bromoform, and bromomethane. Positive and nondetected results are affected by these noncompliances. These results for the aforementioned compounds were qualified as estimated, J and UJ, respectively.

Samples 003-TW034-01 and 003-TW054-01 were reanalyzed at a dilution due to trichloroethene exceeding the instrument linear calibration range. Sample 003-TW074-01 was reanalyzed at a dilution due to cis-1,2-dichloroethene and trichloroethene exceeding the linear calibration range. The original analyses were chosen for validation. The dilution results for these compounds were transposed over the original sample results and used in the validation of this SDG. In addition, cis-1,2-dichloroethene exceeded the linear calibration range in sample 003-TW018-01 and the dilution result was transposed over the original result and used in validation of this SDG.

Semivolatiles

The following table summarizes the maximum concentration of semivolatile compounds detected in the

laboratory method quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L
Bis(2-ethylhexyl)phthalate	47 µg/kg	470 µg/kg
Di-n-octyl phthalate	46 µg/kg	460 µg/kg

Samples Affected: All.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors, percent moisture and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for these compounds in the affected samples were qualified in the manner indicated by the blank action table.

The continuing calibration %Ds were greater than 25% for pyridine, 3-nitroaniline, 4-nitroaniline, and 3,3'-dichlorobenzidine. Only nondetected results were reported for the aforementioned compounds in the affected samples and these results were qualified as estimated, (UJ).

The continuing calibration %Ds were greater than 25% for carbazole and dibenzo(a,h)anthracene. Positive results were qualified as estimated, J, in the affected samples.

All eight surrogates were outside of quality control limits for sample 003SB05402. The sample was therefore reanalyzed and the reanalysis was used in the validation of this SDG.

The Matrix Spike/Matrix Spike Duplicate analyses for sample 003SB03501 displayed low %Rs for N-nitrosodi-n-propylamine, 1,2,4-trichlorobenzene and pyrene. The Relative Percent Differences (%RPDs) for 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, and acenaphthene were high. No action was taken based on these noncompliances since the Matrix Spike results were compliant.

The holding time until extraction for 003-SB054-02 was exceeded. Positive and nondetected results were qualified as estimated, (J) and (UJ).

Positive results reported at concentrations below the CRQL were qualified as estimated, (J).

PCBs

The holding time until extraction was exceeded for sample 003-SB054-02. Only nondetected results were reported and these results were qualified as estimated, (UJ).

Both surrogates were outside of quality control limits for sample 003-SB054-02. Therefore, the sample was re-extracted and re-analyzed and the reanalysis was used in the validation of this SDG.

The initial calibration %RSD was greater than 20% for Aroclor-1016 on Column DB-608 for one peak only, therefore no action was taken.

Additional Comments

There were no additional problems associated with this SDG.

EXECUTIVE SUMMARY

Laboratory Performance Issues: The holding times were exceeded for the reanalyses of sample 003-SB054-02 for the semivolatile and pesticide/PCB fractions. The initial calibration %RSD for acetone was greater than 30%. Contamination was observed in the volatile and semivolatile fractions in the method blanks. Initial and continuing calibration Relative Response Factors were less than 0.05 for the volatile fraction. Continuing calibration %Ds greater than the 25% quality control limit were reported for several volatile and semivolatile compounds. All eight surrogates were outside of quality controls limits for semivolatiles in sample 003-SB054-02. Both pesticide/PCB soil surrogates for the same sample were less than 10% in both columns.

Other Factors Affecting Data Quality: Some positive results were reported at concentrations below the CRQL in the volatile and semivolatile fractions.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Pamela A. Koryak
Risk Assessor/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF04

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PEST
003-TB012-01	A ² R ¹		
003-TB013-01	A ² R ¹		
003-TB014-01	A ² R ¹		
003-TB015-01	A ² R ¹ J ³		
003-TW018-01	A ² R ¹ J ¹⁰	A ⁵⁴	
003-TW034-01	A ² R ¹ J ¹⁰	A ⁵⁴	
003-TW035-01	A ² R ¹	A ⁵⁴	
003-TW054-01	A ² R ¹ J ³	A ⁵⁴ J ⁹	
003-TW074-01	A ² R ¹ J ¹⁰	A ⁵⁴	
003-SB018-02	A ^{1,2} J ^{2,5,10}	A ⁴ J ⁶	
003-SB034-01	A ^{1,2} J ¹⁰	A ⁴ J ⁶	
003-SB034-03	A ^{2,3} J ¹⁰	A ⁴ J ⁶	
003-SB035-01	A ^{1,2} J ^{2,10}	A ⁴ J ⁶	
003-SB035-02	A ^{1,2} J ^{2,10}	A ⁴ J ⁶	
003-SB054-01	A ^{1,2} J ¹⁰	A ⁴ J ^{6,7,8,10}	
003-SB054-02	A ^{1,2}	A ⁴ J ^{10,11}	J ¹¹
003-SB074-01	A ^{1,2} J ^{2,10}	A ⁴ J ⁶	
003-SB074-03	A ^{2,3} J ^{1,2,4,10}	A ⁴ J ⁶	
003-SBDP1-02	A ^{2,3} J ^{1,2,4,10}	A ⁴ J ⁶	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, qualify positive results for acetone as nondetected (U) due to method quality control blank contamination.
- A² - Accept data, qualify positive results for methylene chloride as nondetected (U) due to method quality control blank contamination.
- A³ - Accept data, qualify positive results for acetone as estimated (J) since the positive result is greater than the blank action level.
- A⁵ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected (U) due to blank contamination.
- R¹ - Reject data, qualify nondetected results as (UR) for acetone, 2-butanone, and/or 2-hexanone due to the initial and continuing calibration Relative Response Factors less than 0.05.
- J¹ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, qualify positive and nondetected results for bromoform and tetrachloroethene chloride as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for bromomethane as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify positive results for acetone as estimated (J) as a result of initial calibration %RSDs greater than 30%.
- J⁵ - Accept data, but qualify nondetected results for acetone as estimated, (UJ), as a result of initial calibration %RSDs greater than 30%.

MEMO TO: MR. MARK SLADIC
DATE: OCTOBER 17, 1997 - PAGE 6

- J⁶ - Accept data, but qualify nondetected results for 3-nitroaniline, 4-nitroaniline, and 3,3'-dichlorobenzidine as estimated (UJ), due to continuing calibration %Ds greater than 25%.
- J⁷ - Accept data, but qualify positive results for carbazole as estimated, (J), as a result of continuing calibration %Ds greater than 25%.
- J⁸ - Accept data, but qualify positive results for dibenzo(a,h)anthracene as estimated, (J), as a result of continuing calibration %Ds greater than 25%.
- J⁹ - Accept data, but qualify nondetected results for pyridine, 4-nitroaniline, and 3,3'-dichlorobenzidine as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J¹⁰ - Accept data, but qualify positive results less than the CRQL as estimated, (J).
- J¹¹ - Accept data, but qualify positive and nondetected results due to a holding time exceedance.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown substituted benzene Undecane 1,2,2-Trichloro-1,2,2-trifluoroethane Unknown
Semivolatile	Unknown(s) Unknown alkane(s) Unknown hydrocarbon(s) Triphenyl ester phosphoric acid Sulfur Unknown PAH(s) Benzaldehyde Acetophenone



C-49-11-7-083

DATE: NOVEMBER 14, 1997

COPIES: DV FILE

SAMPLES: 5/Aqueous/

003-TW-054-F1

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 14, 1997 - PAGE 2

C-49-11-7-083

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	26.00 ug/L	130 ug/L
arsenic	1.0 ug/L	5.0 ug/L
barium	3.3 ug/L	16.5 ug/L
calcium	51.7 ug/L	258.5 ug/L
iron ⁽¹⁾	36.500 ug/L	182.5 ug/L
magnesium	57.8 ug/L	289 ug/L
manganese	2.1 ug/L	10.5 ug/L
potassium	209.6 ug/L	1048 ug/L
selenium	1.2 ug/L	6.0 ug/L
sodium	41.0 ug/L	205 ug/L
thallium	1.1 ug/L	5.5 ug/L
zinc ⁽¹⁾	6.700 ug/L	33.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for arsenic, selenium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analyte were qualified as estimated, "J" and "UJ", respectively.

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-018-F1. The nondetected result reported for selenium in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-074-F1, 003-TW-035-F1, 003-TW-034-F1 and 003-TW-054-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

MEMO TO: M. SLADIC
DATE: NOVEMBER 14, 1997 - PAGE 3

C-49-11-7-083

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for selenium was > 120% quality control limit. However, no validation actions are required for this noncompliance.

The GFAA Post Digestion Spike Recoveries for arsenic were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-018-F1, 003-TW-074-F1 and 003-TW-035-F1. However, no validation actions were warranted for arsenic in the affected samples as all results were either nondetects or were qualified as blank contamination.

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-074-F1. However, no validation actions were warranted for selenium in the affected sample as the result was qualified as blank contamination.

Executive Summary

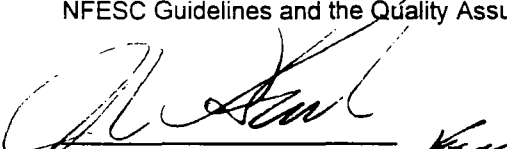
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

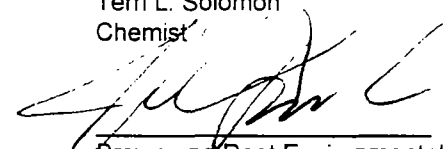
Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (sample 003-TW-018-F1) and thallium (samples 03-TW-074-F1, 003-TW-035-F1, 003-TW-034-F1 and 003-TW-054-F1) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 14, 1997 - PAGE 4

C-49-11-7-083

NIROP FRIDLEY
 SDG BRF04

TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	J ¹
antimony			manganese	J ¹
arsenic	A ¹	J ¹	mercury	
barium		J ¹	nickel	
beryllium			potassium	J ¹
cadmium			selenium	A ¹ J ^{1,2,3}
calcium		J ¹	silver	
chromium			sodium	J ¹
cobalt			thallium	J ³
copper			vanadium	
iron		J ¹	zinc	A ¹
lead				

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.



C-49-11-7-065

TO:	M. SLADIC	DATE:	NOVEMBER 14, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM CTO 003 - NIROP FRIDLEY SDG - BRF04		
SAMPLES:	3/Soils/ 003-SB-018-02 003-SB-035-01 003-SB-035-02		

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF04, consists of three (3) soil environmental samples. No field duplicates were included within this SDG.

All samples were analyzed for hexavalent chromium. Samples 003-SB-035-01 and 003-SB-035-02 were also analyzed for total organic carbon. The samples were collected by Brown and Root Environmental on July 26 and 28, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 14, 1997 - PAGE 2

C-49-11-7-065

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	12 mg/L	60 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary


Laboratory Performance: Total organic carbon was present in the laboratory method blank.

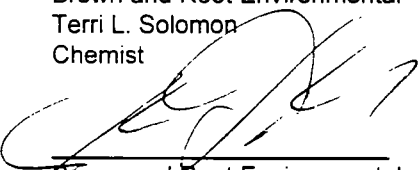
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 14, 1997 - PAGE 3

C-49-11-7-065

NIROP FRIDLEY
SDG BRF04

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
----------------------	----------------

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-10-7-193

TO: MARK SLADIC
FROM: DANA PIETO

DATE: OCTOBER 29, 1997
CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs, SVOCs, & PCBs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF05

SAMPLES: Soils\VOA:

003-SB-037-01	003-SB-037-02	003-SB-037-03	003-SB-063-01
003-SB-063-03	003-SB-DP1-03	003-SB-P01-01	003-SB-P01-02
003-SB-P06-01	003-SB-P06-03		

Waters\VOA:

003-AB-002-01	003-TB-016-01	003-TB-017-01	003-TB-018-01
003-TW-037-01	003-TW-063-01	003-TW-DP1-02	003-TW-P06-01

Soils\SVOA\PCB:

003-SB-037-01	003-SB-037-03	003-SB-063-01	003-SB-063-03
003-SB-DP1-03	003-SB-P01-01	003-SB-P01-02	003-SB-P06-01
003-SB-P06-03			

Waters\SVOA\PCB:

003-AB-002-01	003-TW-037-01	003-TW-063-01	003-TW-DP1-02
003-TW-P06-01			

The sample set for the CTO 003 NIROP Fridley, SDG BRF05, consists of ten soil and four aqueous environmental samples, one ambient blank (designated AB), and three trip blanks (designated TB). All samples were analyzed for Target Compound List (TCL) volatile, semivolatile, and PCB organic compounds. The trip blanks were analyzed for TCL volatile compounds only.

The samples were collected by Brown & Root Environmental on August 5, 6, and 7, 1997, and analyzed by Laucks Testing Laboratories. The volatile, semivolatile, and PCB compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All aqueous analyses were conducted using SW-846 Method 8260A. All other analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- • Initial and continuing calibrations
- • Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Laboratory control sample results

MEMO TO: MARK SLADIC
DATE: OCTOBER 29, 1997 - PAGE 2

- * . Internal standard performance
- * . Detection limits
- * . Sample identification
- * . Sample quantitation
- * . Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatiles

All positive results reported at concentrations less than the Contract required Quantitation Limit (CRQL) were qualified as estimated, (J).

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Methylene chloride	4 µg/kg	—	40 µg/kg
Methylene chloride	0.5 µg/L	5 µg/L	—
Acetone*	2.1 µg/L	21 µg/L	—

*-Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: All.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). Positive results for the compound reported at concentrations above the detection limit were qualified as estimated, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Positive results reported for these compounds in the affected samples were qualified as estimated (J), and nondetected results were considered to be unusable and were rejected (UR).

Continuing calibration percent differences (%Ds) exceeded the 25% quality control limit for bromomethane, chloromethane, methylene chloride, trichloroethene, and 1,1,2,2-tetrachloroethane. Nondetected results for these compounds in associated samples were qualified as estimated, (UJ).

In samples 003-TW-P06-01 and 003-TW-DP1-02, the compound cis-1,2-dichloroethene exceeded the linear calibration range of the instrument. Sample 003-TW-P06-01 was reanalyzed at a 20x dilution and sample 003-TW-DP1-02 was reanalyzed at a 10X dilution. Only the cis-1,2-dichloroethene results were transposed over to the original sample results and used in the validation of the SDG.

In sample 003-TW-037-01, the compound trichloroethene exceeded the linear calibration range of the instrument. It was reanalyzed at a 5x dilution. Only the trichloroethene results were transposed over to the original sample results and used in the validation of the SDG.

Samples 003-SB-P01-01 and 003-SB-P01-02 were analyzed at 10x dilutions. Sample 003-SB-P06-01 was analyzed at a 5X dilution. Samples 003-SB-037-01 and 003-SB-DP1-03 were analyzed at 2.5x dilutions.

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Semivolatiles

All positive results reported at concentrations less than the CRQL were qualified as estimated. (J).

The following semivolatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentration indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Bis(2-ethylhexyl) phthalate	11 µg/kg	—	110 µg/kg
Bis(2-ethylhexyl) phthalate	1 µg/L	10 µg/L	—
Diethylphthalate*	1 µg/L	10 µg/L	—
Di-n-butylphthalate*	1 µg/L	10 µg/L	—

*-Maximum concentration of contaminant detected in a field quality control blank.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). Positive results for the compound reported at concentrations above the detection limit were qualified estimated, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

A continuing calibration %D exceeded the 25% quality control limit for carbazole. Nondetected results for this compound in associated samples were qualified as estimated, (UJ).

The results for the samples found in the database did not conform to the EPA rounding rules.

The limits for the Internal Standard Area and RT Summary are reversed on the forms. The upper limit should be the lower limit and the lower limit should be the upper limit.

PCBs

No problems were noted.

Additional Note:

Sample 003-SB-037-02 did not receive analysis for semivolatiles and PCBs. Analysis of these parameters were cancelled by Brown & Root Environmental.

Executive Summary

Laboratory Performance: The volatile initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. The volatile continuing calibration %Ds for bromomethane, chloromethane, methylene chloride, trichloroethene, and 1,1,2,2 tetrachloroethane exceeded the 25% quality control limit. The semivolatile continuing calibration %D for carbazole exceeded the 25% quality control limit. Methylene chloride was detected in laboratory method blanks for volatiles. Bis(2-ethylhexyl)phthalate was detected in laboratory method blanks for semivolatiles.

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Other Factors Affecting Data Quality: Methylene chloride and acetone were detected in the field quality control blanks for volatiles. Diethylphthalate, and di-n-butylphthalate were detected in the field quality control blanks for semivolatiles.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

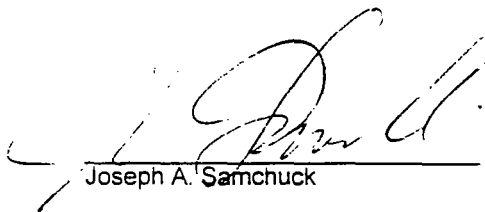
The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Dana L. Pioto

Brown & Root Environmental
Data Validator



Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF05**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile			Semivolatile		PCB
003-TB-016-01	A ¹	J ¹	R ²			
003-SB-063-01	A ¹	J ³		A ²	J ⁷	
003-SB-063-03	A ¹	J ^{3,7}		A ²		
003-TW-063-01		J ^{1,7}	R ¹	A ²		
003-AB-002-01		J ^{1,2,7}	R ¹	A ²		
003-TB-017-01	A ¹	J ¹	R ²			
003-SB-037-01	A ¹	J ^{3,7}		A ²	J ⁸	
003-SB-037-02	A ¹	J ^{3,7}				
003-SB-037-03	A ¹	J ^{5,6,7}		A ²	J ⁸	
003-SB-DP1-03	A ¹	J ^{3,7}		A ²	J ⁸	
003-TW-037-01		J ^{1,7}	R ²	A ²		
003-TB-018-01	A ¹	J ¹	R ²			
003-SB-P06-01	A ¹	J ^{5,6}		A ²	J ⁷	
003-SB-P06-03	A ¹	J ^{3,7}		A ²		
003-TW-P06-01		J ^{1,7}	R ²	A ²		
003-TW-DP1-02		J ^{1,7}	R ²	A ²		
003-SB-P01-01	A ²	J ^{5,6}		A ²		
003-SB-P01-02	A ²	J ^{5,6}		A ²	J ⁹	

- A¹ - Accept data, but change positive results for methylene chloride to a revised detection limit and qualify as nondetected, (BU), as a result of laboratory method blank contamination.
- A² - Accept data, but change positive results for bis(2-ethylhexyl)phthalate to a revised detection limit and qualify as nondetected, (BU), as a result of laboratory method blank contamination.
- J¹ - Accept data, but qualify nondetects for bromomethane as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J² - Accept data, but qualify positive results estimated (J) for acetone as a result of the initial calibration and continuing calibration RRFs less than 0.05.
- J³ - Accept data, but qualify nondetects for chloromethane as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J⁴ - Accept data, but qualify nondetects for methylene chloride as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J⁵ - Accept data, but qualify nondetects for trichloroethene as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J⁶ - Accept data, but qualify nondetects for 1,1,2,2 tetrachloroethane as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J⁷ - Accept data, but qualify positive results less than the contract required quantitation limit (CRQL) as estimated, (J).
- J⁸ - Accept data, but qualify nondetects for carbazole as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- R¹ - Reject nondetects for 2-butanone and 2-hexanone as a result of initial and/or continuing calibrations RRFs less than 0.05.

R² - Reject nondetects for acetone, 2-butanone, and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

Fraction

Named TIC

Volatile

Unknown substituted Benzene(s)
Unknown(s)
Unknown hydrocarbon
Undecane
Perfluorotributylamine
Tridecane

Semivolatile

Unknown alkane(s)
C3 Benzene(s)
C4 Benzene(s)
C5 Benzene(s)
Unknown phthalate
Unknown(s)
Bromacil
Unknown PAH

Data Qualifier Key:

- U - Value is a nondetect as reported by the laboratory and should not be considered present.
- J - Positive result is estimated as result continuing calibration %D > 25% and/or value below the CRQL.
- UJ - Nondetected result is considered to be estimated as a result of continuing calibration %D > 25%.
- BU - Nondetected blank (for Region V) as a result of blank contamination and should not be considered present.



C-49-11-7-105

Overview

All samples were analyzed for hexavalent chromium. Samples 003-SB-063-01 and 003-SB-063-03 were also analyzed for total organic carbon. The samples were collected by Brown and Root Environmental on August 5, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

- * • Data Completeness
- Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

The attached Table 1 summarizes the validation recommendations which were based on the following information:

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C-49-11-7-105

Holding Times

The aqueous sample analyzed for hexavalent chromium was received by the laboratory outside of the 24 hour hold time. The nondetected result reported for hexavalent chromium in the affected sample was qualified as estimated, "UJ".

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	12 mg/L	60 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

Laboratory Performance: The hold time for hexavalent chromium was exceeded. Total organic carbon was present in the laboratory method blank.

Other Factors Affecting Data Quality: None.


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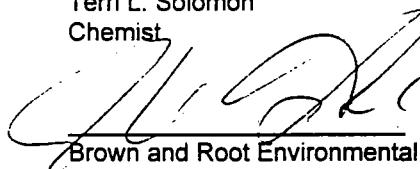
C-49-11-7-105

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

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DATE: NOVEMBER 17, 1997 - PAGE 4

C-49-11-7-105

NIROP FRIDLEY
SDG BRF05

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent.chromium	J ²

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".

J² - Accept data but qualify nondetected results as estimated, "UJ", as a result of exceeded hold time.



C-49-11-7-095

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • Laboratory Duplicate Results
- Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results

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- GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
arsenic ⁽²⁾	1.00 ug/L	5.00 ug/L	NA
barium	3.5 ug/L	17.5 ug/L	3.5 mg/kg
beryllium	0.3 ug/L	1.5 ug/L	NA
beryllium ⁽¹⁾	0.080 mg/kg	NA	0.40 mg/kg
cadmium	2.2 ug/L	11.0 ug/L	2.2 mg/kg
calcium	42.0 ug/L	210 ug/L	42.0 mg/kg
chromium	6.0 ug/L	30.0 ug/L	6.0 mg/kg
cobalt	3.0 ug/L	15.0 ug/L	3.0 mg/kg
iron	9.0 ug/L	45.0 ug/L	9.0 mg/kg
lead	1.1 ug/L	5.5 ug/L	1.1 mg/kg
magnesium	38.5 ug/L	192.5 ug/L	38.5 mg/kg
manganese	2.7 ug/L	13.5 ug/L	2.7 mg/kg
nickel	4.3 ug/L	21.5 ug/L	4.3 mg/kg
potassium	133.3 ug/L	666.5 ug/L	133.3 ug/L
selenium ⁽²⁾	3.400 ug/L	17.0 ug/L	NA
sodium	40.6 ug/L	NA	40.6 mg/kg
sodium ⁽²⁾	75.4 ug/L	377 ug/L	NA
zinc ⁽¹⁾	1.700 mg/kg	NA	8.5 mg/kg
zinc ⁽²⁾	4.400 ug/L	22.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for arsenic, beryllium, chromium, cobalt, lead, magnesium, manganese, nickel, selenium and sodium have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

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Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium affecting the soil matrix was < 30% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR".

The MS %R for antimony affecting the soil matrix was < 75% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

The MS %R for cyanide affecting the aqueous matrix was < 30% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR".

Field Duplicate Results

Field duplicate imprecision was noted for soil sample pair, 003-SB-037-01 / 003-SB-DP1-03, for manganese. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P06-01 and 003-TW-DP1-03. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P06-01 and 003-TW-037-01. The positive results reported for thallium in the affected samples were qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike, laboratory duplicate and the ICP Serial Dilution analyses affecting the aqueous matrix was performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, cadmium, chromium and lead were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for lead was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-037-01. However, no validation actions were warranted as the result reported in the affected sample was a nondetected result.

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-063-01, 003-SB-P06-01, 003-SB-P01-01, 003-SB-P01-02, 003-SB-037-01, 003-SB-037-03 and 003-SB-DP1-03. However, no validation actions were warranted as the nondetected results reported in the affected samples were rejected for a more severe noncompliance.

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C-49-11-7-095

Executive Summary

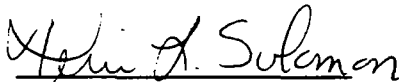
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

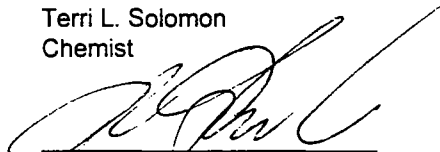
Other Factors Affecting Data Quality: The MS %R for selenium affecting the soil matrix were < 30% quality control limit. The MS %R for antimony affecting the soil matrix was < 75% quality control limit. The MS %R for cyanide affecting the aqueous matrix were < 30% quality control limit. Field duplicate imprecision was noted for manganese affecting the soil matrix. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-P06-01 and 003-TW-DP1-03) and thallium (samples 003-TW-P06-01 and 003-TW-037-01) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
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NIROP FRIDLEY
SDG BRF05
TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	A ¹	J ¹	
antimony		J ²	manganese	A ¹	J ^{1,3}	
arsenic	A ¹		mercury			
barium		J ¹	nickel	A ¹	J ¹	
beryllium	A ¹		potassium		J ¹	
cadmium			selenium	A ¹	J ^{1,4}	R ¹
calcium		J ¹	silver			
chromium	A ¹	J ¹	sodium	A ¹	J ¹	
cobalt	A ¹	J ¹	thallium		J ⁴	
copper			vanadium			
iron		J ¹	zinc		J ¹	
lead	A ¹	J ¹	cyanide			R ²

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", respectively, as a result of low MS %R affecting the soil matrix.
- J³ - Accept data but qualify positive results as estimated, "J", as a result of field duplicate imprecision affecting the soil matrix.
- J⁴ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results, "UR", as a result of MS %R < 30% affecting the soil matrix.
- R² - Reject nondetected results, "UR", as a result of MS %R < 30% affecting the aqueous matrix.



INTERNAL CORRESPONDENCE

C-49-11-7-103

TO: M. SLADIC

DATE: NOVEMBER 17, 1997

FROM: TERRI L. SOLOMON

COPIES: DV FILE

**SUBJECT: INORGANIC DATA VALIDATION - DISSOLVED TAL METALS
CTO 003 - NIROP FRIDLEY
SDG - BRF05D**

SAMPLES: 4/Aqueous/

003-TW-037-F1

003-TW-063-F1

003-TW-DP1-F2

003-TW-P06-F1

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF05D, consists of four (4) aqueous environmental samples. One (1) field duplicate pair (003-TW-P06-F1 / 003-TW-DP1-F2) was included within this SDG.

All samples were analyzed for Dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on August 5, 6 and 7, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

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DATE: NOVEMBER 17, 1997 - PAGE 2

C-49-11-7-103

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
cadmium	2.2 ug/L	11.0 ug/L
chromium	6.0 ug/L	30.0 ug/L
iron	8.1 ug/L	40.5 ug/L
lead	1.1 ug/L	5.5 ug/L
magnesium	21.2 ug/L	106 ug/L
manganese ⁽¹⁾	1.6 ug/L	8.0 ug/L
selenium ⁽¹⁾	2.900 ug/L	14.5 ug/L
sodium ⁽¹⁾	75.400 ug/L	377 ug/L
zinc ⁽¹⁾	4.400 ug/L	22.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for cadmium, chromium and zinc have been qualified as nondetected "U". Positive results greater than the action level for iron, magnesium, manganese, selenium and sodium have been qualified as estimated, "J".

Field Duplicate Results

Field duplicate imprecision was noted for sample pair, 003-TW-P06-F1 / 003-TW-DP1-F2, for iron and manganese. The positive results reported for the aforementioned analytes were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P06-F1 and 003-TW-DP1-F2. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in 003-TW-DP1-F2 and 003-TW-037-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The method of standard addition correlation coefficient for selenium affecting sample 003-TW-037-F1 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample was qualified as estimated, "J".

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DATE: NOVEMBER 14, 1997 - PAGE 3

C-49-11-7-103

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike, laboratory duplicate and the ICP Serial Dilution analyses affecting the aqueous matrix was performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic and cadmium were outside the 80-120% quality control limit. However, no validation actions are required for this noncompliance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for iron and manganese. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-P06-F1 and 003-TW-DP1-F2) and thallium (samples 003-TW-DP1-F2 and 003-TW-037-F1) were < 85% quality control limit. The method of standard addition correlation coefficient for selenium affecting sample 003-TW-037-F1 was < 0.995.

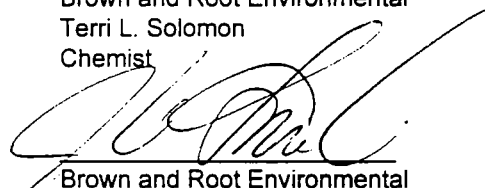
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF05D

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	J ^{1,2}
arsenic		mercury	
barium		nickel	
beryllium		potassium	
cadmium	A ¹	selenium	J ^{1,2,4}
calcium		silver	
chromium	A ¹	sodium	J ¹
cobalt		thallium	J ³
copper		vanadium	
iron	J ^{1,2}	zinc	A ¹
lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of field duplicate imprecision.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.
- J⁴ - Accept data but qualify the positive result in sample 003-TW-037-F1 as estimated, "J", as a result of the method of standard addition correlation coefficient < 0.995.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-111

TO: M. SLADIC DATE: NOVEMBER 18, 1997

FROM: TERRI L. SOLOMON COPIES: DV FILE

**SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF06**

SAMPLES: 4/Soils/

003-SB-023-01 003-SB-023-03 003-SB-P12-01 003-SB-P12-03

3/Aqueous/

003-TW-023-01 003-TW-P01-01 003-TW-P12-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF06, consists of four (4) soil environmental samples and three (3) aqueous environmental samples. No field duplicates were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on August 8, 9, and 10, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 2

C-49-11-7-111

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
arsenic ⁽²⁾	1.00 ug/L	5.00 ug/L	NA
cadmium	2.2 ug/L	11.0 ug/L	2.2 mg/kg
calcium ⁽¹⁾	4.060 mg/kg	NA	20.3 mg/kg
chromium	6.0 ug/L	30.0 ug/L	6.0 mg/kg
iron	9.0 ug/L	45.0 ug/L	9.0 mg/kg
lead	1.1 ug/L	5.5 ug/L	1.1 mg/kg
magnesium	21.2 ug/L	106 ug/L	21.2 mg/kg
manganese ⁽¹⁾	0.340 mg/kg	NA	1.7 mg/kg
manganese ⁽²⁾	1.600 ug/L	8.00 ug/L	NA
potassium ⁽¹⁾	25.700 ug/L	NA	128.5 mg/kg
selenium ⁽¹⁾	0.200 mg/kg	NA	1.0 mg/kg
selenium ⁽²⁾	3.400 ug/L	17.0 ug/L	NA
sodium ⁽¹⁾	11.820 mg/kg	NA	59.1 mg/kg
sodium ⁽²⁾	75.400 ug/L	377 ug/L	NA
zinc ⁽¹⁾	1.00 mg/kg	NA	5.00 mg/kg
zinc ⁽²⁾	4.400 ug/L	22.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for cadmium, chromium, lead, selenium, sodium and zinc have been qualified as nondetected "U". Positive results greater than the action level for arsenic, calcium, chromium, iron, lead, magnesium, manganese, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium affecting the aqueous matrix was < 30% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR". Positive results reported for the aforementioned analyte were qualified as estimated, "J".

The MS %R for iron affecting the aqueous matrix was > 120% quality control limit. Positive results reported for the aforementioned analyte were qualified as estimated, "J".

The MS %R for thallium affecting the soil matrix was < 30% quality control limit. Nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR".

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 2

C-49-11-7-111

The MS %R for lead affecting the soil matrix was < 30% quality control limit. Positive results reported for the aforementioned analyte in the affected sample were qualified as estimated, "J".

The MS %R for antimony, arsenic and selenium affecting the soil matrix was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analytes were qualified as estimated, "J" and "UJ", respectively.

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for calcium, iron and manganese affecting the soil analyses. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Differences (%Ds) for aluminum, barium, calcium, iron, magnesium and manganese affecting the soil matrix were > 10% quality control limit. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for arsenic were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-023-03 and 003-SB-P12-01. The positive results reported for arsenic in the affected samples were qualified as estimated, "J".

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-P12-01. The nondetected result reported for selenium in the affected sample was qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, cadmium, and lead were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for lead was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-023-01. However, no validation actions were warranted as the result reported in the affected sample was nondetected.

The GFAA Post Digestion Spike Recovery for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-P12-01. However, no validation actions were warranted as the nondetected result reported in the affected sample was rejected for a more severe noncompliance.

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 4

C-49-11-7-111

Executive Summary


Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for lead and thallium affecting the soil matrix were < 30% quality control limit. The MS %Rs for antimony, arsenic and selenium affecting the soil matrix was < 75% quality control limit. The MS %R for selenium affecting the aqueous matrix were < 30% quality control limit. The MS %R for iron affecting the aqueous matrix was < 75% quality control limit. Laboratory duplicate imprecision was noted for calcium, iron and manganese affecting the soil matrix. The ICP Serial Dilution %Ds for aluminum, barium, calcium, iron, magnesium and manganese were > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (samples 003-SB-023-03 and 003-SB-P12-01) and selenium (sample 003-SB-P12-01) were outside the 85-115% quality control limit.

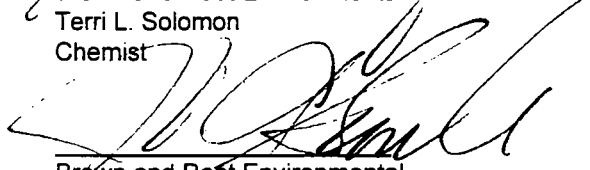
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 5

C-49-11-7-111

NIROP FRIDLEY
SDG BRF06
TABLE 1 - RECOMMENDATION SUMMARY

aluminum		J ⁵	magnesium		J ^{1,5}
antimony		J ³	manganese		J ^{1,4,5}
arsenic		J ^{1,3,6}	mercury		
barium		J ⁵	nickel		
beryllium			potassium		J ¹
cadmium	A ¹		selenium	A ¹	J ^{1,2,3,6} R ²
calcium		J ^{1,4,5}	silver		
chromium	A ¹	J ¹	sodium	A ¹	J ¹
cobalt			thallium		R ¹
copper			vanadium		
iron		J ^{1,2,4,5}	zinc	A ¹	J ¹
lead	A ¹	J ^{1,3}	cyanide		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of MS %R affecting the aqueous matrix.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of MS %R affecting the soil matrix.
- J⁴ - Accept data but qualify positive results as estimated, "J", as a result of laboratory duplicate imprecision affecting the soil matrix.
- J⁵ - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D affecting the soil matrix.
- J⁶ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of low GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results, "UR", as a result of MS %R < 30% affecting the soil matrix.
- R² - Reject nondetected results, "UR", as a result of MS %R < 30% affecting the aqueous matrix.



C-49-11-7-114

SAMPLES: 3/Aqueous/
003-TW-023-F1 003-TW-P01-F1 003-TW-P12-F1

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 2

C-49-11-7-114

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
cadmium	2.2 ug/L	11.0 ug/L
chromium	6.0 ug/L	30.0 ug/L
iron	8.1 ug/L	40.5 ug/L
lead	1.1 ug/L	5.5 ug/L
magnesium	21.2 ug/L	106 ug/L
manganese ⁽¹⁾	1.600 ug/L	8.0 ug/L
selenium ⁽¹⁾	2.900 ug/L	14.5 ug/L
sodium ⁽¹⁾	75.400 ug/L	377 ug/L
zinc ⁽¹⁾	4.400 ug/L	22.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for chromium, lead, selenium and zinc have been qualified as nondetected "U". Positive results greater than the action level for iron, magnesium, manganese, selenium and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 30% quality control limit. Positive results reported for the aforementioned analyte were qualified as estimated, "J". The nondetected results reported for the aforementioned analyte were qualified as rejected, "UR".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-023-F1 and 003-TW-P12-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The method of standard addition correlation coefficient for selenium affecting sample 003-TW-023-F1 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample was qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

MEMO TO: M. SLADIC
DATE: NOVEMBER 18, 1997 - PAGE 3

C-49-11-7-114

The matrix spike, laboratory duplicate and the ICP Serial Dilution analyses affecting the ICP analyses were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic and cadmium were outside the 80-120% quality control limit. However, no validation actions are required for this noncompliance.

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-P12-F1. However, no validation actions were required as the nondetected result reported for selenium in the affected sample was qualified as a result of a more severe noncompliance.

Executive Summary

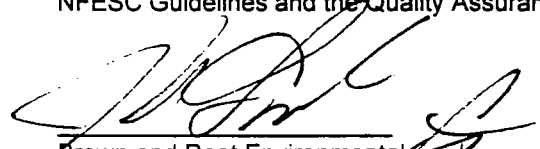
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %R for selenium was < 30% quality control limit. The GFAA Post Digestion Spike Recoveries for thallium (samples 003-TW-023-F1 and 003-TW-P12-F1) were < 85% quality control limit. The method of standard addition correlation coefficient for selenium affecting sample 003-TW-023-F1 was < 0.995.

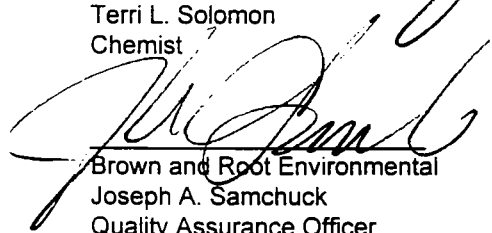
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF06

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	J ¹
arsenic		mercury	
barium		nickel	
beryllium		potassium	
cadmium		selenium	A ¹ J ^{1,2,4}
calcium		silver	
chromium	A ¹	sodium	J ¹
cobalt		thallium	J ³
copper		vanadium	
iron	J ¹	zinc	A ¹
lead	A ¹		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.
- J⁴ - Accept data but qualify the positive result in sample 003-TW-023-F1 as estimated, "J", as a result of the method of standard addition correlation coefficient < 0.995.
- R¹ - Reject nondetected results, "UR", as a result of extremely low MS %R.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

TO: MR. MARK SLADIC DATE: DECEMBER 15, 1997

FROM: LINDA KARSONOVICH COPIES: DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF06

SAMPLES: 14/Soil/

003-SB-023-01	003-SB-037-10BR
003-SB-023-03	003-SB-P06-02BR
003-SB-P12-01	003-SB-P06-05BR
003-SB-P12-03	003-SB-P06-07BR
003-SB-063-04BR	003-SB-P01-03BR
003-SB-063-14BR	003-SB-P01-05BR
003-SB-037-05BR	003-SB-P01-09BR

4/Aqueous/

003-TB-019-01	003-TW-023-01
003-TW-P01-01	003-TW-P12-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF06 consists of fourteen (14) solid environmental samples, three (3) aqueous environmental samples and one (1) field quality control blank. The samples, with the exception of the trip blank (designated -TB-) and the soil samples (designated -BR), were analyzed for Target Compound List (TCL) volatile and semivolatile organic compounds. The environmental samples were also analyzed for PCBs. The trip blanks and samples designated BR soils were analyzed for volatile compounds only. The field crew did not designate samples for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. The laboratory also analyzed blank spike samples. No field duplicates were included in this SDG.

The samples were collected by Brown and Root Environmental on August 5th, 6th, 7th, 8th, 9th, and 10th, 1997 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260 and CLP OLM03.1 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- • Initial/continuing calibrations
- • Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- * • Matrix Spike/Matrix Spike Duplicate Results

- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial calibration and/or continuing calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results reported in the affected samples were qualified as estimated, (J) and rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for chloromethane, trichloroethene, 1,1,2,2-tetrachloroethane, bromomethane, and methylene chloride. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	4 µg/kg	40 µg/kg
Methylene Chloride	0.5 µg/L	5 µg/L
Acetone	0.9 µg/L	9 µg/L, ug/kg

Samples affected: All

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for methylene chloride and acetone were qualified in the manner indicated by the blank action table. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Dilutions were performed on samples 003-TW-P12-01 (5X) and 003-TW-023-01 (5X) as the compound trichloroethene was above the linear range of the instrument. The results from the dilutions for this compound only were transcribed over to the undiluted sample results.

A water sample was not designated for matrix spike/matrix spike duplicate analysis on the chain of custody sheets and was not performed for this SDG. The laboratory did perform blank spike/blank spike duplicate analysis for water.

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for pyridine, 4-nitroaniline, and 3,3'-dichlorobenzidine. Positive and nondetected results reported for the aforementioned target compounds in the affected samples were qualified as estimated, (J) and (UJ).

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	11 µg/Kg	110 µg/Kg

Samples affected: All soil samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate were qualified in the manner indicated by the blank action table.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs and %Ds outside than their respective quality control limits were reported for several volatile and semivolatile compounds. Methylene chloride and bis(2-ethylhexyl)phthalate were detected in the laboratory method blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF06

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PCB
003-TB-019-01	R ¹ J ^{3,5}		
003-TW-P01-01	R ¹ J ^{3,5}	J ⁵	
003-TW-023-01	R ¹ J ^{3,5}	J ⁵	
003-TW-P12-01	R ¹ J ^{3,5}	J ⁵	
003-SB-023-01	A ^{1,2} J ^{1,5}	J ⁴	
003-SB-023-03	A ¹ J ^{2,5}	J ⁴	
003-SB-P12-01	A ¹ J ^{1,5}	A ³ J ⁴	
003-SB-P12-03	A ¹ J ^{2,5}	J ⁴	
003-SB-063-04BR	A ¹ J ^{1,5}		
003-SB-063-14BR	A ¹ J ^{1,5}		
003-SB-037-05BR	A ¹ J ^{1,5}		
003-SB-037-10BR	A ¹ J ^{2,5}		
003-SB-P06-02BR	A ¹ J ^{2,5}		
003-SB-P06-05BR	A ¹ J ^{2,5}		
003-SB-P06-07BR	A ¹ J ^{2,5}		
003-SB-P01-03BR	A ¹ J ²		
003-SB-P01-05BR	A ^{1,2} J ^{2,5}		
003-SB-P01-09BR	A ¹ J ^{2,5}		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but replace positive results for methylene chloride with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A² - Accept data, but replace positive results for acetone with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A³ - Accept data, but replace positive results for bis(2-ethylhexyl)phthalate with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- R¹ - Reject data, qualify nondetected results for acetone, 2-butanone, and 2-hexanone due to initial and continuing calibration RRFs falling below the 0.05 criterion as rejected, (UR) and qualify positive results as estimated, (J).
- J¹ - Accept data, but qualify positive and nondetected results for chloromethane and as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J² - Accept data, but qualify positive and nondetected results for trichloroethene and 1,1,2,2-tetrachloroethane as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J³ - Accept data, but qualify positive and nondetected results for bromomethane as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J⁴ - Accept data, but qualify positive and nondetected results for pyridine, 4-nitroaniline, and 3,3'dichlorobenzidine as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than their 25% quality control limit.
- J⁵ - Accept data, but qualify positive results below the CRQL as estimated, (J).

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown(s) trichloromonofluoromethane
Semivolatile	Unknown(s) PAH alkane



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-105

TO: M. SLADIC DATE: NOVEMBER 19, 1997

FROM: TERRI L. SOLOMON COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM
CTO 003 - NIROP FRIDLEY
SDG - BRF07

SAMPLES: 14/Soils/

003-SB-036-01	003-SB-036-02	003-SB-036-03	003-SU-B01-01
003-SU-B02-01	003-SU-B03-01	003-SU-B04-01	003-SU-B05-01
003-SU-DP1-01	003-SU-B06-01	003-SU-B07-01	003-SU-B08-01
003-SU-B09-01	003-SU-B10-01		

1/ Aqueous/

003-SU-RB-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF07, consists of fourteen (14) soil environmental samples and (1) rinsate blank. One (1) field duplicate pair (003-SU-B05-01 / 003-SU-DP1-01) was included within this SDG.

All samples were analyzed for hexavalent chromium and total organic carbon with the exception of 003-SB-036-01, 003-SB-036-02, 003-SB-036-03 and 003-SU-RB-01. These samples were analyzed for hexavalent chromium only. The samples were collected by Brown and Root Environmental on August 12 and 13, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- * • Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 2

C-49-11-7-105

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	15 mg/L	75 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

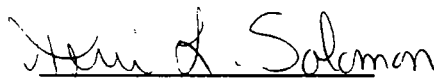
Laboratory Performance: Total organic carbon was present in the laboratory method blank.

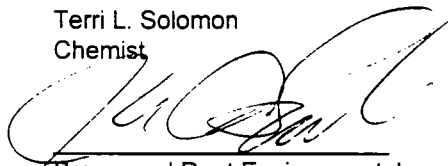
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 3

C-49-11-7-105

NIROP FRIDLEY
SDG BRF07

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent chromium	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-118

TO: M. SLADIC DATE: NOVEMBER 19, 1997
FROM: TERRI L. SOLOMON COPIES: DV FILE
SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF07
SAMPLES: 2/Soils/
003-SB-036-01 003-SB-036-03
1/Aqueous/
003-TW-036-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF07, consists of two (2) soil environmental samples and one (1) aqueous environmental sample. No field duplicate pairs were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on August 12, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - * • Matrix Spike Results
 - * • Laboratory Duplicate Results
 - * • ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 2

C-49-11-7-118

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level (aqueous)	Action Level (soil)
arsenic ⁽²⁾	1.00 ug/L	5.00 ug/L	NA
cadmium	2.2 ug/L	11.0 ug/L	2.2 mg/kg
calcium ⁽¹⁾	4.060 mg/kg	NA	20.3 mg/kg
chromium	6.0 ug/L	30.0 ug/L	6.0 mg/kg
iron	9.0 ug/L	45.0 ug/L	9.0 mg/kg
lead	1.1 ug/L	5.5 ug/L	1.1 mg/kg
magnesium	21.2 ug/L	106 ug/L	21.2 mg/kg
manganese ⁽¹⁾	0.340 mg/kg	NA	1.7 mg/kg
manganese ⁽²⁾	1.600 ug/L	8.0 ug/L	NA
potassium ⁽¹⁾	25.700 mg/kg	NA	128.5 mg/kg
selenium ⁽¹⁾	0.200 mg/kg	NA	1.0 mg/kg
selenium ⁽²⁾	3.400 ug/L	17.0 ug/L	NA
sodium ⁽¹⁾	11.820 mg/kg	NA	59.1 mg/kg
sodium ⁽²⁾	75.4 ug/L	377 ug/L	NA
thallium	1.0 ug/L	5.0 ug/L	1.0 mg/kg
zinc ⁽¹⁾	1.000 mg/kg	NA	5.0 mg/kg
zinc ⁽²⁾	4.400 ug/L	22.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for cadmium, selenium and sodium have been qualified as nondetected "U". Positive results greater than the action level for arsenic, chromium, iron, lead, magnesium, manganese, potassium, selenium, sodium and zinc have been qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-036-01. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-036-01. The nondetected result reported for selenium in the affected sample was qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 3

C-49-11-7-118

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-036-01. The nondetected result reported for thallium in the affected sample was qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike, laboratory duplicate and the ICP Serial Dilution analyses affecting the soil and aqueous matrix were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, cadmium and lead were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

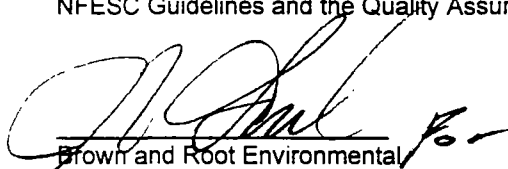
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

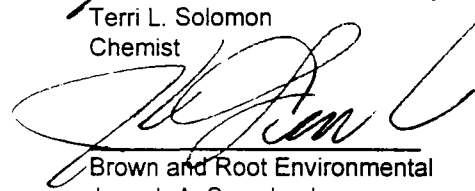
Other Factors Affecting Data Quality: The GFAA Post Digestion Spike Recoveries for arsenic (sample 003-SB-036-01), selenium (sample 003-SB-036-01) and thallium (sample 003-TW-036-01) were outside the 85-115% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 19, 1997 - PAGE 4

C-49-11-7-118

NIROP FRIDLEY
 SDG BRF07
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	J ¹
arsenic	J ^{1,2}	mercury	
barium		nickel	
beryllium		potassium	J ¹
cadmium	A ¹	selenium	A ¹ J ^{1,2}
calcium		silver	
chromium	J ¹	sodium	A ¹ J ¹
cobalt		thallium	J ²
copper		vanadium	
iron	J ¹	zinc	J ¹
lead	J ¹	cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of GFAA Post Digestion Spike Recoveries.

C-49-10-7-109

TO: MR. MARK SLADIC DATE: NOVEMBER 17, 1997

FROM: BONNI J. SMATHERS COPIES: DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003 NIROP, FRIDLEY, MINNESOTA
SDG BRF07

SAMPLES: 9/Solid/
003-SB-023-05-BR 003-SB-023-15-BR 003-SB-036-01
003-SB-036-02 003-SB-036-03 003-SB-036-05-BR
003-SB-036-07-BR 003-SB-DP1-22-BR 003-SB-P12-05-BR
003-SB-P12-11-BR

2/Aqueous/
003-TB-020-01 003-TW-036-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley SDG BRF07 consists of nine (9) solid environmental samples, 1 (1) aqueous sample, and one (1) trip blank. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB compounds). One field duplicate pair was (003-SB-036-05-BR/003-SB-DP1-22-BR) included in this SDG. SampleS 003-SB-023-15-BR was designated by the field crew for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis.

The samples were collected by Brown and Root Environmental on August 9th, 10th, 11th and 12th, 1997 and analyzed by Laucks Testing Labs. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Contract Laboratory Program (CLP) Statement of Work OLM03.1, 8260A and 8270B analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- * • Internal Standard Performance
- * • Matrix spike results
- * • Blank spike results
- * • Field duplicate results
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits
- * • Tentatively identified compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial and Continuing Calibration Relative Response Factors (RRFs) for acetone, 2-hexanone, and 2-butanone were less than 0.050. This noncompliance indicates a lack of instrument response. Positive and

MEMO TO: MR. MARK SLADIC**DATE: NOVEMBER 17, 1997 - PAGE 2**

nondetected results are affected by this noncompliance. Therefore, nondetected results reported for these compounds in the affected samples were considered unreliable and were rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for bromoform, carbon tetrachloride, cis-1,3-dichloropropene, dibromochloromethane, trans-1,3-dichloropropene, trichloroethene, and 1,1,2,2-tetrachloroethane. Positive and nondetected results are affected by these noncompliances. Therefore, positive and nondetected results reported for the aforementioned compounds were qualified as estimated, (J) and (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	1.5 ug/L	15 ug/L
Methylene Chloride	4 ug/kg	40 ug/kg

Samples affected: All samples.

- Maximum concentration detected in a field quality control blank.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture, and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for methylene chloride. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 17, 1997 - PAGE 3
Semivolatiles

Continuing calibration Percent Differences (%Ds) greater than the 25% quality control limit were reported for pyridine, 4-nitroaniline, and 3,3'-dichlorobenzidine. Positive and nondetected results are affected by these noncompliances. Therefore, nondetected results for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
bis(2-ethylhexyl)phthalate	11 ug/kg	110 ug/kg

Samples affected: All soil samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for bis(2-ethylhexyl)phthalate.

PCBs

No problems were noted with the PCB fraction.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and Continuing Calibration RRFs less than 0.050 were reported for acetone and 2-butanone. Continuing calibration %Ds greater than the 25% quality control limit were also reported for several volatile and semivolatile compounds. Methylene chloride was detected in the volatile laboratory method blanks. Bis(2-ethylhexyl)phthalate was detected in the semivolatile laboratory method blank.

Other Factors Affecting Data Quality: No additional problems were noted.

MEMO TO: MR. MARK SLADIC

DATE: NOVEMBER 17, 1997 - PAGE 4

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), US EPA Region V Standard Operating Procedures for Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Bonni J. Smathers
Industrial Hygienist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF07

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA		PCB
003-SB-023-05-BR	A ¹	J ^{2,4}			
003-SB-023-15-BR	A ¹	J ^{2,4}			
003-SB-036-01	A ¹	J ^{2,4}	A ²	J ^{3,4}	
003-SB-036-02	A ¹	J ^{2,4}			
003-SB-036-03	A ¹	J ^{2,4}	A ²	J ³	
003-SB-036-05-BR	A ¹	J ^{2,4}			
003-SB-036-07-BR	A ¹	J ^{2,4}			
003-SB-DP1-22-BR	A ¹	J ^{2,4}			
003-SB-P12-05-BR	A ¹	J ²			
003-SB-P12-11-BR	A ¹	J ^{2,4}			
003-TB-020-01	A ¹	J ¹	R ¹		
003-TW-036-01		J ¹		J ⁴	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify positive results for methylene chloride as nondetected, (U), as a result of laboratory blank contamination.
- A² - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify nondetected results for bromoform, carbon tetrachloride, cis-1,3-dichloropropene, dibromochloromethane, and trans-1,3-dichloropropene, as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, but qualify positive and nondetected results for trichloroethene, and 1,1,2,2-tetrachloroethane, and 2-hexanone as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for pyridine, 4-nitroaniline, and 3,3'-dichlorobenzidine as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify positive results as estimated, (J), as a result of a value below the CRQL.
- R¹ - Reject data and qualify nondetected results for acetone, 2-hexanone, and 2-butanone as unreliable,(UR), as a result of initial and continuing calibration RRFs less than 0.050.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	None
Semivolatile	Unknown alkane(s) Unknown(s)

NIROP FRIDLEY

SDG BRF07

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA		PCB
003-SB-023-05-BR	A ¹	J ^{2,4}			
003-SB-023-15-BR	A ¹	J ^{2,4}			
003-SB-036-01	A ¹	J ^{2,4}	A ²	J ^{3,4}	
003-SB-036-02	A ¹	J ^{2,4}			
003-SB-036-03	A ¹	J ^{2,4}	A ²	J ³	
003-SB-036-05-BR	A ¹	J ^{2,4}			
003-SB-036-07-BR	A ¹	J ^{2,4}			
003-SB-DP1-22-BR	A ¹	J ^{2,4}			
003-SB-P12-05-BR	A ¹	J ²			
003-SB-P12-11-BR	A ¹	J ^{2,4}			
003-TB-020-01	A ¹	J ¹	R ¹		
003-TW-036-01		J ¹		J ⁴	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify positive results for methylene chloride as nondetected, (U), as a result of laboratory blank contamination.
- A² - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify nondetected results for bromoform, carbon tetrachloride, cis-1,3-dichloropropene, dibromochloromethane, and trans-1,3-dichloropropene, as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, but qualify positive and nondetected results for trichloroethene, and 1,1,2,2-tetrachloroethane, and 2-hexanone as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for pyridine, 4-nitroaniline, and 3,3'-dichlorobenzidine as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify positive results as estimated, (J), as a result of a value below the CRQL.
- R¹ - Reject data and qualify nondetected results for acetone, 2-hexanone, and 2-butanone as unreliable,(UR), as a result of initial and continuing calibration RRFs less than 0.050.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	None
Semivolatile	Unknown alkane(s) Unknown(s)



C-49-11-7-120

TO: M. SLADIC **DATE: NOVEMBER 19, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - DISSOLVED TAL METALS
CTO 003 - NIROP FRIDLEY
SDG - BRF07D

SAMPLES: 1/Aqueous/
003-TW-036-F1

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF07D, consists of one (1) aqueous environmental sample. No field duplicate pairs were included within this SDG.

All samples were analyzed for Dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on August 12, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - * • Matrix Spike Results
 - * • Laboratory Duplicate Results
 - ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 2

C-49-11-7-120

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
cadmium	2.2 ug/L	11.0 ug/L
chromium	6.0 ug/L	30.0 ug/L
iron	8.1 ug/L	40.5 ug/L
lead	1.1 ug/L	5.5 ug/L
magnesium	21.2 ug/L	106 ug/L
manganese ⁽¹⁾	1.6 ug/L	8.0 ug/L
selenium ⁽¹⁾	2.900 ug/L	14.5 ug/L
sodium ⁽¹⁾	75.400 ug/L	377 ug/L
zinc ⁽¹⁾	4.400 ug/L	22.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for zinc have been qualified as nondetected "U". Positive results greater than the action level for iron, magnesium, manganese, selenium, sodium and zinc have been qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for manganese was > 10% quality control limit. The positive result reported for the aforementioned analyte was qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-036-F1. The nondetected result reported for thallium in the affected sample was qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike and laboratory duplicate analyses for GFAA analyses and mercury affecting the aqueous matrix were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic and cadmium were outside the 80-120% quality control limit. However, no validation actions are required for this noncompliance.

MEMO TO: M. SLADIC
DATE: NOVEMBER 19, 1997 - PAGE 2

C-49-11-7-120

Executive Summary

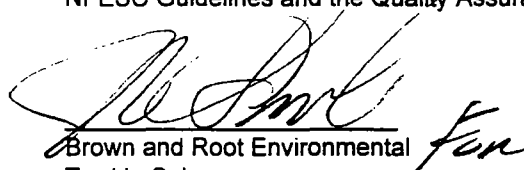
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

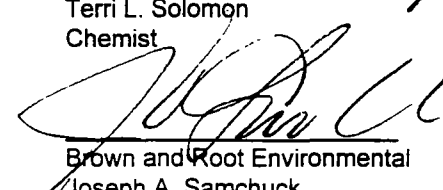
Other Factors Affecting Data Quality: ICP Serial Dilution %D for manganese was > 10% quality control limit. The GFAA Post Digestion Spike Recovery for thallium (sample 003-TW-036-F1) was < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF07D

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	J ^{1,2}
arsenic		mercury	
barium		nickel	
beryllium		potassium	
cadmium		selenium	J ¹
calcium		silver	
chromium		sodium	J ¹
cobalt		thallium	J ³
copper		vanadium	
iron	J ¹	zinc	A ¹
lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of low GFAA Post Digestion Spike Recoveries.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-125

TO: M. SLADIC DATE: NOVEMBER 20, 1997

FROM: TERRI L. SOLOMON COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF08

SAMPLES: 5/Soils/
003-SB-058-01 003-SB-058-03 003-SB-DP1-04 003-SB-P02-01
003-SB-P02-03

3/Aqueous/
003-AB-003-01 003-TW-058-01 003-TW-P02-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF08, consists of five (5) soil environmental samples and three (3) aqueous environmental samples. One field duplicate pair (003-SB-058-01 / 003-SB-DP1-04) was included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on August 18, 19 and 20, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
 - Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
 - Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
 - ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 2

C-49-11-7-125

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	29.7 ug/L	148.5 ug/L	NA
aluminum ⁽¹⁾	10.860 mg/kg	NA	54.3 mg/kg
barium	3.6 ug/L	18.0 ug/L	NA
barium ⁽¹⁾	0.340 mg/kg	NA	1.7 mg/kg
beryllium	0.4 ug/L	2.0 ug/L	0.4 mg/kg
calcium	39.8 ug/L	199 ug/L	39.8 mg/kg
chromium	6.8 ug/L	34.0 ug/L	6.8 mg/kg
cobalt	4.3 ug/L	21.5 ug/L	NA
cobalt ⁽¹⁾	0.460 mg/kg	NA	2.3 mg/kg
iron	11.1 ug/L	55.5 ug/L	NA
iron ⁽¹⁾	7.020 mg/kg	NA	35.1 mg/kg
magnesium	46.9 ug/L	234.5 ug/L	46.9 mg/kg
manganese	2.3 ug/L	11.5 ug/L	2.3 mg/kg
sodium ⁽¹⁾	13.34 mg/kg	NA	66.7 mg/kg
sodium ⁽²⁾	119.3 ug/L	596.5 ug/L	NA
thallium	1.3 ug/L	6.5 ug/L	1.3 mg/kg
vanadium	2.5 ug/L	12.5 ug/L	2.5 mg/kg
zinc ⁽¹⁾	0.540 mg/kg	NA	2.7 mg/kg
zinc ⁽²⁾	3.900 ug/L	19.5 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, beryllium, calcium, chromium, cobalt, magnesium, sodium, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, beryllium, calcium, chromium, cobalt, iron, magnesium, manganese, sodium, vanadium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium affecting the aqueous matrix was < 30% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR". The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 3

C-49-11-7-125

The MS %R for antimony affecting the soil matrix was < 30% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR".

The MS %Rs for lead and selenium affecting the soil matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for zinc affecting the soil matrix was > 10% quality control limit. The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-058-031. The nondetected result reported for selenium in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-P02-01 and 003-SB-058-03. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The correlation coefficient for selenium analyzed by the method of standard addition for sample 003-TW-P02-01 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample were qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike and laboratory duplicate analyses for mercury affecting the aqueous matrix were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury, selenium, silver and zinc were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The MS %R for mercury affecting the soil matrix was > 125% quality control limit. However, no validation actions were warranted as the sample results reported for the aforementioned analyte were nondetects.

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-058-01 and 003-SB-DP1-04. However, no validation actions are required as the results reported for thallium in the affected samples were qualified as blank contamination.

MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 4

C-49-11-7-125

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

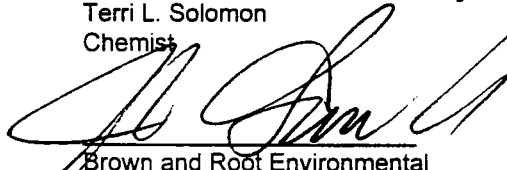
Other Factors Affecting Data Quality: The MS %Rs for selenium affecting the aqueous matrix and antimony affecting the soil matrix were < 30% quality control limit. The MS %Rs for lead and selenium affecting the soil matrix were < 75% quality control limit. The ICP Serial Dilution %D for zinc affecting the soil matrix was > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (sample 003-SB-058-03) and thallium (samples 003-SB-P02-01 and 003-SB-058-03) were outside the < 85% quality control limit. The correlation coefficient for selenium analyzed by the method of standard addition affecting sample 003-TW-P02-01 was < 0.995.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 20, 1997 - PAGE 5

C-49-11-7-125

NIROP FRIDLEY
 SDG BRF08
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹		magnesium	A ¹	J ¹	
antimony			R ¹	manganese		J ¹	
arsenic				mercury			
barium		J ¹		nickel			
beryllium	A ¹	J ¹		potassium			
cadmium				selenium		J ^{2,3,5,6}	R ¹
calcium	A ¹	J ¹		silver			
chromium	A ¹	J ¹		sodium	A ¹	J ¹	
cobalt	A ¹	J ¹		thallium	A ¹	J ⁵	
copper				vanadium	A ¹	J ¹	
iron		J ¹		zinc	A ¹	J ^{1,4}	
lead		J ³		cyanide			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results affecting the aqueous matrix as estimated, "J", as a result of low MS %R.
- J³ - Accept data but qualify positive results and nondetects affecting the soil matrix as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J⁴ - Accept data but qualify positive results affecting the soil matrix as estimated, "J" as a result of ICP Serial Dilution %D.
- J⁵ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.
- J⁶ - Accept data but qualify the positive result in sample 003-TW-P02-01 as estimated, "J", as a result of a correlation coefficient < 0.995.
- R¹ - Reject nondetected data, "UR", as a result of extremely low MS %R.

TO: MR. MARK SLADIC DATE: DECEMBER 16, 1997
FROM: LINDA KARSONOVICH COPIES: DV FILE
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF08

SAMPLES: 13/Soil/

003-SB-P02-01	003-SB-P02-05BR
003-SB-P02-02	003-SB-DP1-23BR
003-SB-P02-03	003-SB-P02-15BR
003-SB-058-01	003-SB-058-05BR
003-SB-058-02	003-SB-DP1-25BR
003-SB-058-03	003-SB-058-15BR
003-SB-DP1-04	

6/Aqueous/

003-TB-021-01	003-TW-P02-01
003-TB-022-01	003-AB-003-01
003-TB-023-01	003-TW-058-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF08 consists of thirteen (13) solid environmental samples, three (3) aqueous environmental samples and three (3) field quality control blanks. The samples, with the exception of the trip blanks (designated -TB-) and the soil samples (designated -BR), were analyzed for Target Compound List (TCL) volatile and semivolatile organic compounds. The environmental samples were also analyzed for PCBs. The trip blanks and BR soils were analyzed for volatile compounds only. The field crew designated samples for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. The laboratory also analyzed blank spike samples. Three field duplicates were included in this SDG.

The samples were collected by Brown and Root Environmental on August 18th, 19th, 20th, and 21st, 1997 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- Matrix Spike/Matrix Spike Duplicate Results
- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial calibration and/or continuing calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results reported in the affected samples were qualified as estimated, (J) and rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for cis-1,3-dichloropropene, trans-1,3-dichloropropene, bromoform, chloroethane, and acetone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

Compound	Maximum Concentration	Action Level
Methylene Chloride	10 µg/Kg	100 µg/Kg
Toluene	1 µg/Kg	5 µg/Kg
Methylene Chloride	2.1 µg/L	21 µg/L

Samples affected: All

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for methylene chloride and toluene were qualified in the manner indicated by the blank action table. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Percent recovery of trichloroethene in the soil MS/MSD could not be calculated as the amount of compound present in the unspiked sample was greater than five times the amount of the spike. A water sample was not designated for matrix spike/matrix spike duplicate analysis on the chain of custody sheets and was not performed for this SDG. The laboratory did perform a blank spike/blank spike duplicate analysis for water.

Dilutions were performed on samples 003-TW-P02-01 (10X), 003-TW-058-01 (5X), and 003-SB-058-01 (2.5X). The compounds cis-1,2-dichloroethene and trichloroethene in sample 003-TW-P02-01 were above the linear range of the instrument. The results from the dilution for these compounds only were transcribed over to the undiluted sample results. The compound trichloroethene in samples 003-TW-058-01 and 003-SB-058-01 was above the linear range of the instrument. The results from the dilutions for this compound only were transcribed over to the undiluted sample results.

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for dimethylphthalate. Positive and nondetected results reported for the aforementioned target compound in the affected samples were qualified as estimated, (J) and (UJ).

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L

Samples affected: All water samples.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate were qualified in the manner indicated by the blank action table.

The RPD of the MS/MSD matrix spike duplicate on sample 003-SB-058-01 failed to meet the minimum acceptance criteria for eight (8) of the eleven (11) compounds. However, recoveries for the MS and blank spike were within the acceptance criteria. The laboratory has proposed that a loss of extract during sample preparation caused the low recoveries. No further action was taken since the blank spike recoveries were within acceptance limits.

Water samples from SDG BRF09 were extracted with water samples from SDG BRF08. A MS/MSD was performed on a sample from SDG BRF09. Recovery information was included in the data package and was within the acceptance criteria.

PCBs

No problems were encountered.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

Samples 003-SB-P02-02 and 003-SB-058-02 were canceled by Brown and Root.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs and %Ds outside than their respective quality control limits were reported for several volatile and semivolatile compounds. Methylene chloride, toluene, and bis(2-ethylhexyl)phthalate were detected in the laboratory method blanks and/or field quality control blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDELY

SDG BRG08

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA	PCB
003-TB-021-01	A ¹	R ¹ J ¹		
003-TB-022-01	A ¹	R ¹		
003-TB-023-01	A ¹	R ¹		
003-TW-P02-01	A ¹	R ¹ J ¹	A ³	
003-AB-003-01	A ¹	R ¹ J ¹	A ³	
003-TW-058-01	A ¹	R ¹	A ³	
003-SB-P02-01	A ²	J ²		J ⁴
003-SB-P02-02	A ²			J ⁴
003-SB-P02-03	A ²			J ⁴
003-SB-058-01	A ²			J ⁴
003-SB-058-02	A ²			J ⁴
003-SB-058-03	A ²			J ⁴
003-SB-DP1-04	A ²			J ⁴
003-SB-P02-05BR	A ²	J ²		
003-SB-DP1-23BR	A ²	J ²		
003-SB-P02-15BR	A ²	J ³		
003-SB-058-05BR	A ²	J ²		
003-SB-DP1-25BR	A ²	J ²		
003-SB-058-15BR	A ²	J ²		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but replace positive results for methylene chloride with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank and/or field quality control blank contamination.
- A² - Accept data, but replace positive results for methylene chloride and toluene with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A³ - Accept data, but replace positive results for bis(2-ethylhexyl)phthalate with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- R¹ - Reject data, qualify nondetected results for acetone, 2-butanone, and 2-hexanone as rejected, (UR) and qualify positive results as estimated, (J).
- J¹ - Accept data, but qualify positive and nondetected results for cis-1,3-dichloropropene, trans-1,3-dichloropropene, and bromoform as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J² - Accept data, but qualify positive and nondetected results for chloroethane and acetone as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than their 25% quality control limit.
- J³ - Accept data, but qualify the nondetected result for acetone as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J⁴ - Accept data, but qualify positive and nondetected results for dimethylphthalate as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown(s) undecane decane
Semivolatile	Unknown(s) hydrocarbon PAH alkane



C-49-11-7-126

Overview

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on August 19 and 20, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- * • GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 2

C-49-11-7-126

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	19.00 ug/L	95.0 ug/L
barium	3.3 ug/L	16.5 ug/L
beryllium	0.4 ug/L	2.0 ug/L
calcium	37.9 ug/L	189.5 ug/L
chromium	6.8 ug/L	34.0 ug/L
iron	9.0 ug/L	45.0 ug/L
magnesium	46.9 ug/L	234.5 ug/L
manganese	2.3 ug/L	11.5 ug/L
sodium	119.3 ug/L	596.5 ug/L
thallium	1.3 ug/L	6.5 ug/L
vanadium	2.3 ug/L	11.5 ug/L
zinc	3.9 ug/L	19.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for beryllium, chromium, thallium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese and sodium have been qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury, selenium and silver were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: None.


MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 3

C-49-11-7-126

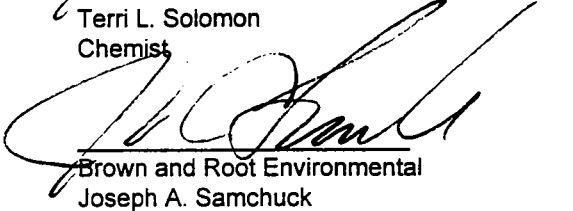
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 20, 1997 - PAGE 4

C-49-11-7-126

NIROP FRIDLEY
SDG BRF08

TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	J ¹
antimony			manganese	J ¹
arsenic			mercury	
barium		J ¹	nickel	
beryllium	A ¹		potassium	
cadmium			selenium	
calcium		J ¹	silver	
chromium	A ¹		sodium	J ¹
cobalt			thallium	A ¹
copper			vanadium	
iron		J ¹	zinc	A ¹
lead				

If the field is left blank, the qualifier is A - Accept all data.

A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



INTERNAL CORRESPONDENCE

C-49-11-7-145

TO:	M. SLADIC	DATE:	NOVEMBER 21, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM CTO 003 - NIROP FRIDLEY SDG - BRF09		

SAMPLES: 7/Soils/

003-SB-007-01	003-SB-007-02	003-SB-027-01	003-SB-027-02
003-SB-027-03	003-SB-030-01	003-SB-030-02	

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF09, consists of seven (7) soil environmental samples. No field duplicate pairs were included within this SDG.

Samples 003-SB-007-01 and 003-SB-007-02 were analyzed for hexavalent chromium. Samples 003-SB-027-01, 003-SB-027-02 and 003-SB-027-03 were analyzed for total organic carbon. Samples 003-SB-030-01 and 003-SB-030-02 were analyzed for hexavalent chromium and total organic carbon. The samples were collected by Brown and Root Environmental on August 21, 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: NOVEMBER 21, 1997 - PAGE 2

C-49-11-7-145

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	15 mg/L	75 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

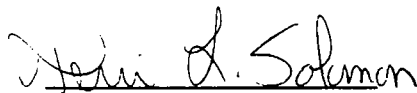
Laboratory Performance: Total organic carbon was present in the laboratory method blank.

Other Factors Affecting Data Quality: None.

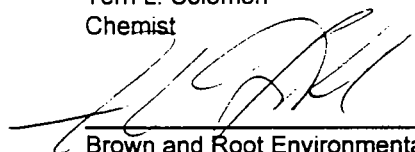
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 21, 1997 - PAGE 3

C-49-11-7-145

NIROP FRIDLEY
SDG BRF09

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent chromium	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



C-49-11-7-144

TO:	M. SLADIC	DATE:	NOVEMBER 21, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - DISSOLVED TAL METALS CTO 003 - NIROP FRIDLEY SDG - BRF09		

SAMPLES: 3/Aqueous/
003-TW-007-F1 003-TW-027-F1 003-TW-030-F1

The sample set for CTO 003, NIROP Fridley, SDG BRF09, consists of three (3) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on August 21, 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • Laboratory Duplicate Results
- ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: NOVEMBER 21, 1997 - PAGE 2

C-49-11-7-144

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level (aqueous)
aluminum ⁽¹⁾	31.800 ug/L	159 ug/L
barium	2.4 ug/L	12.0 ug/L
calcium	38.0 ug/L	190 ug/L
cobalt	4.0 ug/L	20.0 ug/L
iron	11.1 ug/L	55.5 ug/L
magnesium	25.6 ug/L	128 ug/L
manganese	1.1 ug/L	5.5 ug/L
potassium	196.6 ug/L	983 ug/L
silver	5.6 ug/L	28.0 ug/L
zinc ⁽¹⁾	7.300 ug/L	36.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contaminants. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contaminants. Positive results less than the action level for barium, cobalt and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese and potassium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for selenium and thallium were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes were qualified as estimated, "J" and "UJ", respectively.

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for iron was > 10% quality control limit. The positive results reported for the aforementioned analyte were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for lead were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-007-F1, 003-TW-027-F1 and 003-TW-030-F1. The nondetected results reported for lead in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recovery for selenium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-007-F1. The nondetected result reported for lead in the affected sample was qualified as estimated, "UJ".

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DATE: NOVEMBER 21, 1997 - PAGE 3

C-49-11-7-144

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-007-F1, 003-TW-027-F1 and 003-TW-030-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The correlation coefficient for selenium analyzed by the method of standard addition for sample 003-TW-030-F1 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample were qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury and selenium were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for selenium and thallium were < 75% quality control limit. The ICP Serial Dilution %D for iron was > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for lead (samples 003-TW-007-F1, 003-TW-027-F1 and 003-TW-030-F1), selenium (sample 003-TW-007-F1) and thallium (samples 003-TW-007-F1, 003-TW-027-F1 and 003-TW-030-F1) were < 85% quality control limit. The correlation coefficient for selenium analyzed by the method of standard addition affecting sample 003-TW-030-F1 was < 0.995.


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DATE: NOVEMBER 21, 1997 - PAGE 4


C-49-11-7-144

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 21, 1997 - PAGE 5

C-49-11-7-144

NIROP FRIDLEY
 SDG BRF09
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	J ¹
antimony			manganese	J ¹
arsenic			mercury	
barium	A ¹	J ¹	nickel	
beryllium			potassium	J ¹
cadmium			selenium	J ^{2,4,5}
calcium		J ¹	silver	
chromium			sodium	
cobalt	A ¹		thallium	J ^{2,4}
copper			vanadium	
iron		J ^{1,3}	zinc	A ¹
lead		J ⁴		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects, "J" and "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify positive results, "J", as a result of ICP Serial Dilution %D.
- J⁴ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.
- J⁵ - Accept data but qualify the positive result in sample 003-TW-030-F1 as estimated, "J", as a result of a correlation coefficient < 0.995.

C-49-10-7-112

TO: MR. MARK SLADIC DATE: NOVEMBER 17, 1997
FROM: BONNI J. SMATHERS COPIES: DV FILE
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003 NIROP, FRIDLEY, MINNESOTA
SDG BRF09

SAMPLES: 14/Solid/

003-SB-007-01	003-SB-007-02	003-SB-007-03
003-SB-007-05-BR	003-SB-007-11-BR	003-SB-027-01
003-SB-027-02	03-SB-027-03	003-SB-027-05-BR
003-SB-027-06-BR	003-SB-030-01	003-SB-030-02
003-SB-030-03	03-SB-030-04-BR	

5/Aqueous/

003-TB-024-01	003-TB-025-01	003-TW-007-01
003-TW-027-01	003-TW-030-01	

OVERVIEW

The sample set for CTO 003, NIROP Fridley SDG BRF09 consists of fourteen (14) solid environmental samples, three (3) aqueous samples, and two (2) trip blanks. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and pcb compounds). A field duplicate pair was not included in this SDG. Sample 003-TW-007-01 was designated by the field crew for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis.

The samples were collected by Brown and Root Environmental on August 21st, 22nd, and 23rd, 1997 and analyzed by Laucks Testing Labs. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Contract Laboratory Program (CLP) Statement of Work (SOW) OLM03.1, 8260A and 8270B analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- * • Internal Standard Performance
- Matrix spike results
- * • Blank spike results
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits
- * • Tentatively identified compounds

MEMO TO: MR. MARK SLADIC

DATE: NOVEMBER 17, 1997 - PAGE 2

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

The aqueous initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-hexanone, and 2-butanone were less than 0.050. This noncompliance indicates a lack of instrument response. Positive and nondetected results are affected by this noncompliance. Therefore, nondetected results reported for these compounds in the affected samples were considered unreliable and were rejected, (UR).

A continuing calibration Percent Difference (%D) greater than 25% was reported for acetone. Positive and nondetected results are affected by this noncompliance. Therefore, positive and nondetected results reported for the acetone were qualified as estimated, (J) and (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	7 ug/kg	70 ug/kg
Methylene Chloride	3.5 ug/L	35 ug/L

Samples affected: All soil and aqueous samples.

- Maximum concentration detected in a field quality control blank.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for methylene chloride. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses of sample 003-TW-007-01 yielded a low %R for trichloroethene. A high Relative Percent Difference (%RPD) was also reported for trichloroethene. The positive result in the unspiked sample was qualified as estimated, (UJ).

Samples 003-SB03-004BR and 003-SB027-01 were analyzed at 0.5 grams.

Semivolatiles

Continuing calibration Percent Differences (%Ds) greater than the 25% quality control limit were reported for hexachlorocyclopentadiene, pyridine, and 4-nitroaniline. Positive and nondetected results are affected by these noncompliances. Therefore, nondetected results for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
bis(2-ethylhexyl)phthalate	1 ug/kg	10 ug/kg

Samples affected: All soil samples.

MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 17, 1997 - PAGE 3

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for bis(2-ethylhexyl)phthalate.

PCBs

No problems were noted with the PCB fraction.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 17, 1997 - PAGE 4
EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and Continuing Calibration RRFs less than 0.050 were reported for acetone and 2-butanone. Continuing calibration %Ds greater than the 25% quality control limit were also reported for several volatile and semivolatile compounds. Methylene chloride was detected in the volatile laboratory method blanks. Bis(2-ethylhexyl)phthalate was detected in the semivolatile laboratory method blank.

Other Factors Affecting Data Quality: Poor matrix spike recoveries were noted in the volatile fraction.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), US EPA Region V Standard Operating Procedures for Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Bonni J. Smathers
Industrial Hygienist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

MEMO TO: MR. MARK SLADIC
 DATE: NOVEMBER 17, 1997 - PAGE 5

NIROP FRIDLEY

SDG BRF09

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA	PCB
003-SB-007-01	A ¹	J ^{1,5}	J ^{3,5}	
003-SB-007-02	A ¹	J ^{1,5}	J ^{3,5}	
003-SB-007-03	A ¹	J ¹		
003-SB-007-05-BR	A ¹	J ^{1,5}		
003-SB-007-11-BR	A ¹	J ^{1,5}		
003-SB-027-01		J ¹	J ^{3,5}	
003-SB-027-02	A ¹	J ⁵	J ^{3,5}	
003-SB-027-03	A ¹	J ⁵	J ^{3,5}	
003-SB-027-05-BR	A ¹	J ⁵		
003-SB-027-06-BR	A ¹	J ⁵		
003-SB-030-01	A ¹	J ⁵	J ^{4,5}	
003-SB-030-02	A ¹	J ⁵	J ^{4,5}	
003-SB-030-03	A ¹	J ⁵		
003-SB-030-04-BR	A ¹			
003-TB-024-01		J ⁵	R ¹	
003-TB-025-01		J ^{5,6}	R ¹	
003-TW-007-01		J ⁵	R ¹	A ²
003-TW-027-01		J ⁵	R ¹	A ²
003-TW-030-01		J ⁵	R ¹	A ²

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify positive results for methylene chloride as nondetected, (J), as a result of laboratory blank contamination.
- A³ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results for methylene chloride as estimated, (J), reported at a concentration greater than the blank action level.
- J² - Accept data, but qualify positive and nondetected results for acetone as estimated, (J) and (UJ), as a result of a continuing calibration %D greater than 25%.
- J³ - Accept data, but qualify nondetected results for hexachlorocyclopentadiene as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.
- J⁴ - Accept data, but qualify nondetected results for pyridine and 4-nitroaniline as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁵ - Accept data, but qualify positive results as estimated, (J), as a result of a value below the CRQL.
- J⁶ - Accept data, but qualify positive results as estimated, (J), as a result of a low MS/MSD percent recovery.
- R¹ - Reject data and qualify nondetected results for acetone, 2-hexanone, and/or 2-butanone as unreliable, (UR), as a result of initial and continuing calibration RRFs less than 0.050.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown hydrocarbon(s) Unknown substituted Benzene Unknown Trichlorofluoroethane 3-methyl decane
Semivolatile	Unknown alkane(s) Unknown(s) Unknown PAH Unknown hydrocarbon(s) Unknown phthalate(s) 2,6-dimethyl octane 3,3'-dimethyl octane decane 2,2',5-trimethyl hexane tridecane



C-49-11-7-133

TO: M. SLADIC **DATE: NOVEMBER 21, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF09

SAMPLES:	7/Soils/			
	003-SB-007-01	003-SB-007-02	003-SB-027-01	003-SB-027-02
	003-SB-027-03	003-SB-030-01	003-SB-030-02	
	3/Aqueous/			
	003-TW-007-01	003-TW-027-01	003-TW-030-01	

The sample set for CTO 003, NIROP Fridley, SDG BRF09, consists of seven (7) soil environmental samples and three (3) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on August 21, 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under NFESC Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: NOVEMBER 21, 1997 - PAGE 2

C-49-11-7-133

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	36.2 ug/L	181 ug/L	36.2 mg/kg
barium	2.4 ug/L	12.0 ug/L	2.4 mg/kg
calcium	38.0 ug/L	190 ug/L	38.0 mg/kg
cobalt	4.0 ug/L	20.0 ug/L	4.0 mg/kg
iron	11.5 ug/L	57.5 ug/L	11.5 mg/kg
magnesium	27.3 ug/L	136.5 ug/L	27.3 mg/kg
manganese	1.3 ug/L	6.5 ug/L	1.3 mg/kg
potassium	196.6 ug/L	983 ug/L	196.6 mg/kg
silver	5.6 ug/L	28.0 ug/L	5.6 mg/kg
sodium ⁽¹⁾	8.960 mg/kg	NA	44.8 mg/kg
thallium	1.2 ug/L	6.0 ug/L	1.2 mg/kg
vanadium	2.3 ug/L	11.5 ug/L	2.3 mg/kg
zinc	14.8 ug/L	74.0 ug/L	14.8 mg/kg

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, cobalt, silver, sodium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, cobalt, iron, magnesium, manganese, potassium, sodium, vanadium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for selenium and thallium affecting the aqueous matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes were qualified as estimated, "J" and "UJ", respectively.

The MS %Rs for antimony and selenium affecting the soil matrix were < 75% quality control limit. The nondetected results reported for the aforementioned analytes were qualified as estimated, "UJ".

The MS %R for mercury affecting the soil matrix was > 125% quality control limit. The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

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DATE: NOVEMBER 21, 1997 - PAGE 3

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Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for mercury affecting the soil matrix. The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for iron affecting the aqueous matrix was > 10% quality control limit. The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for lead were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-027-01 and 003-TW-030-01. The nondetected results reported for lead in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-007-01, 003-SB-007-01, 003-SB-007-02, 003-SB-027-01, 003-SB-027-03, 003-SB-030-01 and 003-SB-030-02. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-007-01, 003-TW-030-01 and 003-TW-027-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The correlation coefficient for selenium analyzed by the method of standard addition for sample 003-TW-030-01 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample were qualified as estimated, "J".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury and selenium were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

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DATE: NOVEMBER 21, 1997 - PAGE 4

C-49-11-7-133

Executive Summary


Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

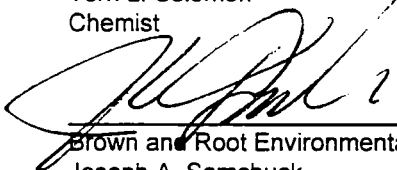
Other Factors Affecting Data Quality: The MS %Rs for selenium and thallium affecting the aqueous matrix were < 75% quality control limit. The MS %Rs for antimony and selenium affecting the soil matrix were < 75% quality control limit. The MS %R for mercury affecting the soil matrix was > 125% quality control limit. Laboratory duplicate imprecision was noted for mercury affecting the soil matrix. The ICP Serial Dilution %D for iron affecting the aqueous matrix was > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for lead (samples 003-TW-027-01 and 003-TW-030-01), selenium (samples 003-TW-007-01, 003-SB-007-01, 003-SB-007-02, 003-SB-027-01, 003-SB-027-03, 003-SB-030-01 and 003-SB-030-02) and thallium (samples 003-TW-007-01, 003-TW-030-01 and 003-TW-027-01) were < 85% quality control limit. The correlation coefficient for selenium analyzed by the method of standard addition affecting sample 003-TW-030-01 was < 0.995.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 21, 1997 - PAGE 5

C-49-11-7-133

NIROP FRIDLEY
SDG BRF09
TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium	J ¹
antimony		J ³	manganese	J ¹
arsenic			mercury	J ^{4,5}
barium		J ¹	nickel	
beryllium			potassium	J ¹
cadmium			selenium	J ^{2,3,7,8}
calcium		J ¹	silver	A ¹
chromium			sodium	A ¹ J ¹
cobalt	A ¹	J ¹	thallium	J ^{2,7}
copper			vanadium	J ¹
iron		J ^{1,6}	zinc	A ¹ J ¹
lead		J ⁷	cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects affecting the aqueous matrix as estimated, "J" or "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify nondetected results affecting the soil matrix as estimated, "UJ", as a result of low MS %R.
- J⁴ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of high MS %R.
- J⁵ - Accept data but qualify positive results affecting the soil matrix as estimated, "J" as a result of laboratory duplicate imprecision.
- J⁶ - Accept data but qualify positive results affecting the aqueous matrix as estimated, "J" as a result of ICP Serial Dilution %D.
- J⁷ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.
- J⁸ - Accept data but qualify the positive result in sample 003-TW-030-01 as estimated, "J", as a result of a correlation coefficient < 0.995.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-151

TO: M. SLADIC **DATE: NOVEMBER 24, 1997**
FROM: TERRI L. SOLOMON **COPIES: DV FILE**
SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF10

SAMPLES: 9/Soils/
003-SB-032-01 003-SB-032-03 003-SB-055-01 003-SB-055-02
003-SB-055-03 003-SB-DP1-05 003-SB-P09-01 003-SB-P09-02
003-SB-P09-03

7/Aqueous/
003-BB-004-01 003-BB-005-01 003-BB-006-01 003-TW-032-01
003-TW-055-01 003-TW-DP1-03 003-TW-P09-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF10, consists of nine (9) soil environmental samples and seven (7) aqueous environmental samples. One field duplicate pair (003-SB-P09-01 / 003-SB-DP1-05) was included within this SDG. Field duplicate sample 003-TW-DP1-03 did not have the corresponding field sample (003-TW-030-01) included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on August 23, 24, 25, 26 and 27, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results

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C-49-11-7-151

- GFAA Post Digestion Spike Recovery Results
 - * • Method of Standard Addition
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	36.2 ug/L	181 ug/L	36.2 mg/kg
barium	2.4 ug/L	12.0 ug/L	2.4 mg/kg
calcium	38.0 ug/L	190 ug/L	38.0 mg/kg
cobalt	4.0 ug/L	20.0 ug/L	4.0 mg/kg
iron	11.5 ug/L	57.5 ug/L	11.5 mg/kg
magnesium	27.3 ug/L	136.5 ug/L	27.3 mg/kg
manganese	1.3 ug/L	6.5 ug/L	1.3 mg/kg
potassium	196.6 ug/L	983 ug/L	196.6 mg/kg
selenium	1.0 ug/L	5.0 ug/L	1.0 mg/kg
silver	5.6 ug/L	28.0 ug/L	5.6 mg/kg
sodium ⁽¹⁾	8.960 mg/kg	NA	44.8 mg/kg
thallium	2.8 ug/L	14.0 ug/L	2.8 mg/kg
vanadium	2.3 ug/L	11.5 ug/L	2.3 mg/kg
zinc	14.8 ug/L	74.0 ug/L	14.8 mg/kg

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, barium, calcium, cobalt, potassium, selenium, silver, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, cobalt, iron, magnesium, manganese, potassium, selenium, sodium, vanadium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and selenium affecting the soil matrix were < 75% quality control limit. The nondetected results reported for the aforementioned analytes in the affected samples were qualified as estimated, "UJ".

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GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-P09-01. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recoveries for lead were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-DP1-03, 003-TW-P09-01, 003-TW-055-01 and 003-TW-032-01. The positive results and nondetects reported for lead in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-P09-01, 003-SB-P09-02, 003-SB-P09-03, 003-SB-DP1-05, 003-SB-055-03, 003-SB-032-03, 003-SB-055-01, 003-SB-055-02 and 003-SB-032-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-DP1-03 and 003-TW-055-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike, laboratory duplicate and ICP Serial Dilution analyses for the metals analyses affecting the aqueous matrix were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for arsenic, lead, mercury, selenium and zinc were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for selenium and thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-032-01. However, no validation actions are required as the results reported for selenium and thallium in the affected sample were qualified as blank contamination.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony and selenium affecting the soil matrix was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (sample 003-SB-P09-01) lead (samples 003-TW-DP1-03, 003-TW-P09-01, 003-TW-055-01 and 003-TW-032-01), selenium (samples 003-SB-P09-01, 003-SB-P09-02, 003-SB-P09-03, 003-SB-DP1-05, 003-SB-055-03, 003-SB-032-03, 003-SB-055-01, 003-SB-055-02 and 003-SB-032-01) and thallium (samples 003-TW-DP1-03 and 003-TW-055-01) were < 85% quality control limit.

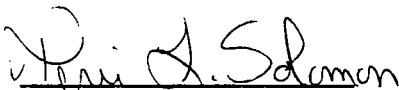
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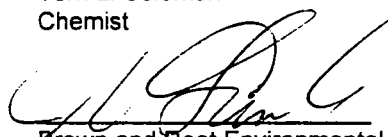
C-49-11-7-151

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 24, 1997 - PAGE 5

C-49-11-7-151

NIROP FRIDLEY
 SDG BRF10

TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium		J ¹
antimony		J ²	manganese		J ¹
arsenic		J ³	mercury		
barium	A ¹	J ¹	nickel		
beryllium			potassium	A ¹	J ¹
cadmium			selenium	A ¹	J ^{1,2,3}
calcium	A ¹	J ¹	silver	A ¹	
chromium			sodium		J ¹
cobalt	A ¹	J ¹	thallium	A ¹	J ³
copper			vanadium	A ¹	J ¹
iron		J ¹	zinc	A ¹	J ¹
lead		J ³	cyanide		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results affecting the soil matrix as estimated, "UJ", as a result of low MS %R.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", as a result of GFAA Post Digestion Spike Recoveries.



C-49-11-7-156

DATE: NOVEMBER 24, 1997

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - DISSOLVED TAL METALS
CTO 003 - NIROP FRIDLEY
SDG -BRF10

SAMPLES: 5/Aqueous/

003-BB-006-F1
003-TW-P09-F1

003-TW-032-F1

003-TW-055-F1

003-TW-DP1-F3

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF10, consists of five (5) aqueous environmental samples. Field duplicate sample 003-TW-DP1-F3 does not have the corresponding field sample (003-TW-030-F1) included within this SDG.

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on August 23, 24, 26 and 27, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Nø Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- Laboratory Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

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DATE: NOVEMBER 24, 1997 - PAGE 2

C-49-11-7-156

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	31.800 ug/L	159.0 ug/L
barium	2.4 ug/L	12.0 ug/L
calcium	38.0 ug/L	190 ug/L
cobalt	4.0 ug/L	20.0 ug/L
iron	11.1 ug/L	55.5 ug/L
magnesium	25.6 ug/L	128 ug/L
manganese	1.1 ug/L	5.5 ug/L
potassium	196.6 ug/L	983 ug/L
selenium	1.0 ug/L	5.0 ug/L
silver	5.6 ug/L	28.0 ug/L
thallium	2.8 ug/L	14.0 ug/L
zinc ⁽¹⁾	7.300 ug/L	36.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for barium, calcium, cobalt, silver, thallium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese, potassium and selenium have been qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-032-F1 and 003-BB-006-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-DP1-F3, 003-TW-P09-F1 and 003-TW-032-F1. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Method of Standard Addition

The correlation coefficient for selenium analyzed by the method of standard addition for sample 003-TW-055-F1 was < 0.995. The positive result reported for the aforementioned analyte in the affected sample was qualified as estimated, "J".

MEMO TO: M. SLADIC
DATE: NOVEMBER 24, 1997 - PAGE 2

C-49-11-7-156

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, copper, lead, mercury, nickel, sodium and thallium reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The matrix spike, laboratory duplicate and ICP Serial Dilution analyses for the metals analyses affecting the aqueous matrix were performed on a sample not included within this SDG. Therefore, no validation actions were required.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, mercury and selenium were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for arsenic was > 125% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-032-F1. However, no validation actions were required as the result reported for arsenic in the affected sample was nondetected.

The GFAA Post Digestion Spike Recovery for thallium was < 75% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-055-F1. However, no validation actions were required as the result reported for thallium in the affected sample was qualified as blank contamination.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-032-F1 and 003-BB-006-F1) and thallium (003-TW-DP1-F3 , 003-TW-P09-f1 and 003-TW-032-F1) were < 85% quality control limit. The correlation coefficient for selenium affecting sample 003-TW-055-F1 was < 0.995.

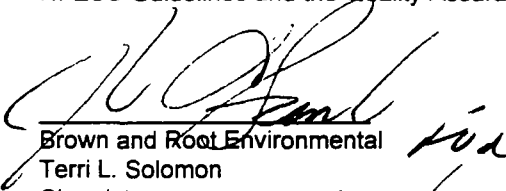
MEMO TO: M. SLADIC
DATE: NOVEMBER 24, 1997 - PAGE 3

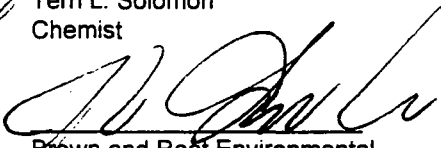
C-49-11-7-156

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: NOVEMBER 24, 1997 - PAGE 4

C-49-11-7-156

NIROP FRIDLEY
 SDG BRF10

TABLE 1 - RECOMMENDATION SUMMARY

aluminum			magnesium	J ¹
antimony			manganese	J ¹
arsenic			mercury	
barium	J ¹		nickel	
beryllium			potassium	J ¹
cadmium			selenium	J ^{1,2,3}
calcium	A ¹	J ¹	silver	A ¹
chromium			sodium	
cobalt	A ¹		thallium	A ¹ J ²
copper			vanadium	
iron		J ¹	zinc	A ¹
lead				

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion & Recoveries.
- J³ - Accept data but qualify the positive result in sample 003-TW-055-F1 as estimated, "J", as a result of a correlation coefficient < 0.995.

C-49-10-7-157

TO: MR. MARK SLADIC **DATE: NOVEMBER 24, 1997**
FROM: PAMELA A. KORYAK **COPIES: DV FILE**
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003 NIROP FRIDLEY
SDG BRF10

SAMPLES: 12/Solid/

003-SB032-01	003-SB032-03	003-SB055-01
003-SB055-02	003-SB055-03	003-SB055-05BR
003-SBDP1-05	003-SBP09-01	003-SBP09-02
003-SBP09-03	003-SBP09-05BR	003-SBP09-09BR

10/Aqueous/

003-TB026-01	003-TB027-01	003-TB028-01
003-TW032-01	003-TW055-01	003-TWDP1-03
003-TWP09-01	003-BB004-01	003-BB005-01
003-BB006-01		

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF10 consists of twelve (12) solid environmental samples and seven (7) aqueous environmental samples and three (3) trip blanks. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB organic compounds), with the exception of the trip blanks which were analyzed for volatile organic compounds only. Sample 003-SB032-01 and 003-TWDP1-03 were designated for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses by the laboratory. Two field duplicate pairs (003-SBDP1-05/003-SBP09-01 and 003-TW030-01/003-TWDP1-03) were included in this SDG.

The samples were collected by Brown and Root Environmental on August 23rd, 24th, 25th, 26th, and 27th, 1997 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Test Methods for Evaluating Solid Wastes, SW-846 Method 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- Holding times
- * • GC/MS tuning and system performance
- Initial and continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- * • Matrix Spike/Matrix Spike Duplicate Results
- Internal Standard Performance
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits
- * • Field duplicate precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data

quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

The following table summarizes the maximum concentration of volatile compounds detected in the method and field quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene chloride*	1.5 µg/L	15 µg/L
Methylene chloride	7 µg/kg	70 µg/kg

* indicates that the compound was detected in a field blank.

Samples affected: All

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Results reported for methylene chloride in the affected samples were qualified in the manner indicated by the blank action table.

The holding time was exceeded for the reanalysis of sample 003-SBDP1-05. However, data from this analysis was not used in validation.

The aqueous initial and continuing calibration Relative Response Factors (RRFs) for acetone and 2-butanone were less than 0.05. Only nondetects were reported and these results were qualified as rejected, UR.

The aqueous continuing Relative Response Factor (RRF) for 2-hexanone was less than 0.05. Only nondetected results were reported for this compound and these results were qualified as rejected, UR.

The medium level initial calibration Percent Relative Standard Deviation (%RSD) was greater than 30% for acetone. Positive results are affected by this noncompliance. This compound in the affected samples was qualified as estimated, (J).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for cis-1,3-dichloropropene and trans-1,3-dichloropropene. Only nondetected results were reported for these compounds in the affected sample and these results were qualified as estimated, UJ.

The volatile internal standard bromochloromethane (BCM) was below the lower quality control limit for sample 003-SBDP1-05. The positive and nondetected results for the compounds associated with this internal standard were qualified as estimated, J and UJ, respectively.

Samples 003-TW055-01 and 003-TWP09-01 were reanalyzed at a dilution due to trichloroethene exceeding the instrument linear calibration range. Sample 003-TW032-01 was reanalyzed at a dilution due to cis-1,2-dichloroethene and trichloroethene exceeding the linear calibration range. The original analyses were chosen for validation. The dilution results for these compounds were transposed over the original sample results and used in the validation of this SDG. In addition, 1,2-dichloroethene (total) and xylenes (total) exceeded the linear calibration range in sample 003-SB032-03 and the dilution results were transposed over the original results and used in validation of this SDG.

Semivolatiles

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method quality control blanks.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L

Samples Affected: All.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value < action level; report value followed by a U.
- Value > action level; report value followed by a J.

Dilution factors and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive and nondetected results reported for bis(2-ethylhexyl)phthalate in the affected samples were qualified in the manner indicated by the blank action table.

The continuing calibration %Ds greater than 25% were noted for dimethyl phthalate and 4-nitroaniline. Only nondetected results were reported for the aforementioned compounds in the affected samples and these results were qualified as estimated, (UJ).

The continuing calibration %Ds were greater than 25% for pyridine and 4-nitroaniline. Only nondetected results were reported for these compounds in the affected samples. These results were qualified as estimated, UJ.

The continuing calibration %Ds were greater than 25% for pyridine and dimethyl phthalate. Only nondetected results were reported for these compounds in the affected samples. These results were qualified as estimated, UJ.

Positive results reported at concentrations below the CRQL were qualified as estimated, (J).

PCBs

The aqueous surrogate recovery for Decachlorobiphenyl (DCB) in Column-DB5 for sample 003-SB032-03 exceeded the quality control limit. The sample was re-analyzed and met all surrogate quality control criteria.

The soil blank spike recovery for Aroclor 1016 fell below the lower quality control limit. A second blank spike and the matrix spike and the matrix spike duplicate all met %recovery quality control criteria. Therefore, no impact on associated data is expected and associated sample data was accepted without qualification.

Additional Comments

no additional problems associated with this SDG.

EXECUTIVE SUMMARY

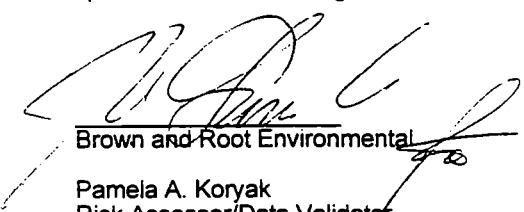
Laboratory Performance Issues: An initial calibration %RSD for acetone was greater than 30%. Contamination was observed in the volatile and semivolatile fractions in the method blanks. Initial and continuing calibration Relative Response Factors were less than 0.05 for the volatile fraction. Continuing calibration %Ds greater than the 25% quality control limit were reported for several volatile and semivolatile compounds..

Other Factors Affecting Data Quality: Some positive results were reported at concentrations below the CRQL in the volatile and semivolatile fractions.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data


Validation (9/94), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Pamela A. Koryak
Risk Assessor/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF10

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PCB
003BB00401	R ^{1,2} J ¹	J ^{2,7}	
003BB00501	R ^{1,2} J ¹	A ³ J ^{2,7}	
003BB00601	R ^{1,2} J ¹	J ^{2,7}	
003TB02601	R ^{1,2}		
003TB02701	R ^{1,2}		
003TB02801	R ^{1,2} J ¹		
003TW03201	A ¹ R ^{1,2}	J ⁶	A ³ J ^{2,6}
003TW05501	A ¹ R ^{1,2}	J ⁶	A ³ J ^{2,6}
003TWD0103	A ¹ R ^{1,2}	J ⁶	A ³ J ⁶
003TWP0901	A ¹ R ^{1,2}	J ⁶	J ²
003SB03201	A ¹	J ⁶	J ^{4,6}
003SB03203	A ¹	J ^{6,7}	J ^{4,6}
003SB05501	A ¹	J ⁶	J ^{3,6}
003SB05502	A ¹	J ⁶	J ^{3,6}
003SB05503	A ¹	J ⁶	J ^{3,6}
003SB05505BR	A ¹		
003SB05505BR	A ¹ J ⁵		J ^{3,6}
003SB05505BR	A ¹	J ⁶	J ^{3,6}
003SBP0901	A ¹	J ⁶	J ^{3,6}
003SBP0902	A ¹	J ⁶	J ^{3,6}
003SBP0903	A ¹	J ⁶	J ^{3,6}
003SBP0905BR	A ¹		
003SBP0909BR	A ¹	J ⁶	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, qualify methylene chloride as (U) or (BU) due to method quality control blank contamination less than the action level.
- A² - Accept data, qualify methylene chloride (BJ) as a result of the method quality control blank contamination greater than the action level.
- A³ - Accept data, but qualify bis(2-ethylhexyl)phthalate (U) or (BU) as a result of method quality control blank contamination less than the action level.
- R¹ - Reject data, qualify nondetected results as (UR) for acetone and 2-butanone due to continuing calibration Relative Response Factors less than 0.05.
- R² - Reject data, qualify nondetected results as (UR) for 2-hexanone due to continuing calibration Relative Response Factors less than 0.05.
- J¹ - Accept data, but qualify nondetected results for cis-1,3-dichloropropene and trans-1,3-dichloropropene as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, qualify nondetected results for dimethylphthalate and 4-nitroaniline as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for pyridine and 4-nitroaniline as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J⁴ - Accept data, but qualify nondetected results for pyridine and dimethylphthalate as estimated (UJ) as a result of continuing calibration %Ds greater than 25%.

- J⁵ - Accept data, but qualify positive and nondetected results as estimated, J and UJ, respectively, due to the internal standard bromochloromethane area less than the 50% quality control limit.
- J⁶ - Accept data, but qualify positive results reported below the CRQL as estimated, (J).
- J⁷ - Accept data, but qualify positive results for acetone as estimated, (J), due to an initial calibration %RSD greater than 30%.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown substituted benzene(s) 1,1,2-Trichloro-1,2,2-trifluoroethane 1,1,3-Trimethylcyclohexane 2,3-Dimethylheptane Unknown hydrocarbon(s) 3-Methyloctane 3-Methylnonane 1-Ethyl-2,3-dimethylcyclohexane 1,1,2,3-Tetramethylcyclohexane Decane (2-Methylpropyl)cyclohexane 3-Methyldecane Trans-decahydronaphthalene Dodecane Butyl ester acetic acid Undecane Unknown(s)
Semivolatile	Unknown(s) Unknown hydrocarbon(s) Unknown alkane(s) Unknown organic acid Unknown trimethyl benzene Bromacil Tetrahydrofuran



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-11-7-157

TO: M. SLADIC DATE: NOVEMBER 24, 1997
FROM: TERRI L. SOLOMON COPIES: DV FILE
SUBJECT: INORGANIC DATA VALIDATION - HEXAVALENT CHROMIUM
CTO 003 - NIROP FRIDLEY
SDG - BRF10
SAMPLES: 2/Aqueous/
003-BB-004-01 003-BB-005-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF10, consists of two (2) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for hexavalent chromium. The samples were collected by Brown and Root Environmental on August 27, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- * • Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: None.


MEMO TO: M. SLADIC
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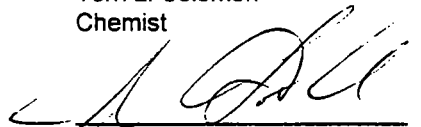
C-49-11-7-157

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: NOVEMBER 24, 1997 - PAGE 3

C-49-11-7-157

NIROP FRIDLEY
SDG BRF10

TABLE 1 - RECOMMENDATION SUMMARY

Hexavalent chromium

If the field is left blank, the qualifier is A - Accept all data.



C-49-12-7-016

TO: M. SLADIC **DATE: DECEMBER 1, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRE11

SAMPLES:	11/Soils/			
	003-SB-033-01	003-SB-033-03	003-SB-070-01	003-SB-070-03
	003-SB-P04-01	003-SB-P04-03	003-SB-P08-01	003-SB-P08-03
	003-SB-P10-01	003-SB-DP1-06	003-SB-P10-03	
	5/Aqueous/			
	003-TW-070-01	003-TW-P04-01	003-TW-P08-01	003-TW-P10-01
	003-TW-DP1-04			

The sample set for CTO 003, NIROP Fridley, SDG BRF11, consists of eleven (11) soil environmental samples and five (5) aqueous environmental samples. Two (2) field duplicate pairs (003-SB-P10-01 / 003-SB-DP1-06 and 003-TW-P10-01 / 003-TW-DP1-04) were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on September 2, 3, 4, 5, 6 and 7, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- * • Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results

MEMO TO: M. SLADIC
DATE: DECEMBER 1, 1997 - PAGE 2

C-49-12-7-016

- GFAA Post Digestion Spike Recovery Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
aluminum	41.1 ug/L	205.5 ug/L	41.1 mg/kg
barium	2.7 ug/L	13.5 ug/L	2.7 mg/kg
beryllium	0.3 ug/L	1.5 ug/L	0.3 mg/kg
calcium	41.3 ug/L	206.5 ug/L	41.3 mg/kg
copper ⁽¹⁾	0.860 mg/kg	NA	4.3 mg/kg
iron	14.1 ug/L	70.5 ug/L	14.1 mg/kg
lead ⁽¹⁾	0.200 mg/kg	NA	1.0 mg/kg
magnesium	41.0 ug/L	205 ug/L	41.0 mg/kg
manganese	1.0 ug/L	5.0 ug/L	1.0 mg/kg
silver	4.9 ug/L	24.5 ug/L	4.9 mg/kg
sodium ⁽²⁾	35.2 ug/L	176 ug/L	35.2 mg/kg
zinc ⁽¹⁾	1.300 mg/kg	NA	6.5 mg/kg
zinc ⁽²⁾	4.700 ug/L	23.5 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for aluminum, beryllium, copper, silver and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and lead affecting the soil matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: DECEMBER 1, 1997 - PAGE 3

C-49-12-7-016

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-P04-01. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-P08-03. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in 003-TW-P08-01, 003-TW-070-01, 003-TW-P10-01, 003-TW-DP1-04, 003-TW-P04-01, 003-SB-070-01, 003-SB-070-03, 003-SB-P10-01, 003-SB-DP1-06, 003-SB-P04-01, 003-SB-033-01 and 003-SB-033-03. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P10-01, 003-TW-DP1-04 and 003-TW-P04-01. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead and manganese were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The Matrix Spike %R for mercury affecting the soil matrix was > 125% quality control limit. However, no validation actions were required as all results reported for the aforementioned analyte in the affected samples were nondetects.

The GFAA Post Digestion Spike Recovery for lead was > 125% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-P04-01. However, no validation actions are required as the result reported for lead in the affected sample was a nondetect.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony and lead affecting the soil matrix were < 75% quality control limit. The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (samples 003-TW-P04-01 and 003-SB-P08-03), selenium (samples 003-TW-P08-01, 003-TW-070-01, 003-TW-P10-01, 003-TW-DP1-04, 003-TW-P04-01, 003-SB-070-01, 003-SB-070-03, 003-SB-P10-01, 003-SB-DP1-06, 003-SB-P04-01, 003-SB-033-01 and 003-SB-033-03) and thallium (samples 003-TW-P10-01, 003-TW-DP1-04 and 003-TW-P04-01) were outside the 85-115% quality control limits.

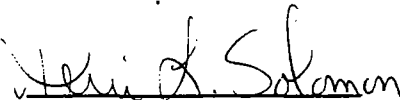
MEMO TO: M. SLADIC
DATE: DECEMBER 1, 1997 - PAGE 4


C-49-12-7-016

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF11
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum	A ¹	J ¹	magnesium	J ¹
antimony		J ²	manganese	J ¹
arsenic		J ⁴	mercury	
barium		J ¹	nickel	
beryllium	A ¹		potassium	
cadmium			selenium	J ^{3,4}
calcium		J ¹	silver	A ¹
chromium			sodium	J ¹
cobalt			thallium	J ⁴
copper	A ¹	J ¹	vanadium	
iron		J ¹	zinc	A ¹ J ¹
lead		J ^{1,2}	cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects affecting the soil matrix as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify nondetected results affecting the aqueous matrix as estimated, "UJ", as a result of low MS %R.
- J⁴ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", as a result of GFAA Post Digestion Spike Recoveries.



C-49-12-7-022

DATE: DECEMBER 2, 1997

COPIES: DV FILE

SAMPLES: 2/Soils/

003-SB-070-03

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 2

C-49-12-7-022

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	15 mg/L	75 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

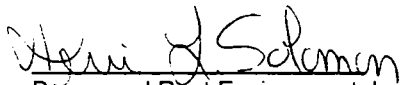
Laboratory Performance: Total organic carbon was present in the laboratory method blank.

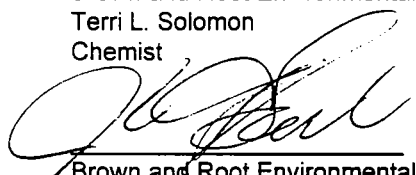
Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 3

C-49-12-7-022

NIROP FRIDLEY
SDG BRF11

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent chromium	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".

Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-7-021

TO: M. SLADIC

DATE: DECEMBER 2, 1997

FROM: TERRI L. SOLOMON

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - DISSOLVED TAL METALS
CTO 003 - NIROP FRIDLEY
SDG -BRF11D

SAMPLES: 5/Aqueous/

003-TW-070-F1
003-TW-DP1-F4

003-TW-P04-F1

003-TW-P08-F1

003-TW-P10-F1

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF11D, consists of five (5) aqueous environmental samples. One (1) field duplicate pair (003-TW-P10-F1 / 003-TW-DP1-F4) is included within this SDG.

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on September 3, 4, 5 and 6, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - * • Laboratory Duplicate Results
 - * • Field Duplicate Results
 - * • ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 2

C-49-12-7-021

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum	41.1 ug/L	205.5 ug/L
barium	2.7 ug/L	13.5 ug/L
beryllium	0.3 ug/L	1.5 ug/L
calcium	41.3 ug/L	206.5 ug/L
iron	14.1 ug/L	70.5 ug/L
magnesium	41.0 ug/L	205 ug/L
manganese	1.0 ug/L	5.0 ug/L
silver	4.9 ug/L	24.5 ug/L
sodium ⁽¹⁾	35.200 ug/L	176.00 ug/L
zinc ⁽¹⁾	4.700 ug/L	23.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for silver and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, iron, magnesium, manganese and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Nondetected results reported for the aforementioned analyte were qualified as estimated, "UJ".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-070-F1, 003-TW-P10-F1, 003-TW-DP1-F4, 003-TW-P04-F1 and 003-TW-P08-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P08-F1, 003-TW-070-F1, 003-TW-P10-F1 and 003-TW-DP1-F4. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 3

C-49-12-7-021

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead and manganese were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-070-F1, 003-TW-P10-F1, 003-TW-DP1-F4, 003-TW-P04-F1 and 003-TW-P08-F1) and thallium (samples 003-TW-P08-F1, 003-TW-070-F1, 003-TW-P10-F1 and 003-TW-DP1-F4) were < 85% quality control limit.

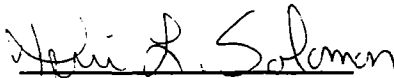
MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 4

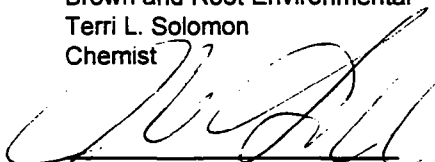
C-49-12-7-021

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 5

C-49-12-7-021

NIROP FRIDLEY
SDG BRF11D
TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	J ¹
arsenic		mercury	
barium	J ¹	nickel	
beryllium		potassium	
cadmium		selenium	J ^{2,3}
calcium		silver	A ¹
chromium		sodium	J ¹
cobalt		thallium	J ³
copper		vanadium	
iron	J ¹	zinc	A ¹
lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", as a result of MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.

C-49-04-6-226

TO: M. SLADIC

DATE: OCTOBER 21, 1997

FROM: DANIEL MENICUCCI

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - TCL VOAs, SVOAs, & PCBs
CTO 003, NIROP FRIDLAY
SDG BRF 11

SAMPLES: 11/Soil

003-SB-033-01	003-SB-033-03	003-SB-070-01	003-SB-070-03
003-SB-04-01	003-SB-P04-03	003-SB-P08-01	003-SB-P08-03
003-SB-P10-01	003-SB-DP1-06	003-SB-P10-03	

10/Aqueous

003-TB-029-01	003-TB-030-01	003-TB-031-01	003-TB-032-01
003-TB-033-01	003-TW-070-01	003-TW-P04-01	003-TW-P08-01
003-TW-P10-01	003-TW-DP1-04		

The sample set for the CTO 003 NIROP Fridlay site, SDG BRF 11, consists of eleven (11) soil and ten (10) aqueous environmental samples. All samples were analyzed for Target Compound List (TCL) volatile, semivolatile and PCB organic compounds. Two field duplicate pairs 003-TW-DP1-04/003-TW-P10-01 and 003-SB-DP1-06/003-SB-P10-01 was included in this SDG. The field crew specified sample 003-SB-P08-03 for matrix spike and matrix spike duplicate analysis.

The samples were collected by Brown & Root Environmental from September 2 - 7, 1997 and analyzed by Laucks Testing Labs. Soil samples were analyzed using CLP Method OLM03.1 analytical reporting protocol. The aqueous samples were analyzed using SW-846 Method 8260A. The data was evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Sample quantitation
- Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: M. SLADIC
 DATE: October 21, 1997 - PAGE 2

Volatile Fraction

The initial and continuing calibration response factor for the samples 003-TWP-0801, 003-TWP-0801DL, 003-TW-07001, 003-TW-07001DL, 003-TB-02901, 003-TB-03001, 003-TB-03101, 003-TW-DP-104, 003-TB-03201, 003-TB-03301, 003-TW-DP-104DL, 003-TWP-1001, 003-TWP-0401 and 003-TWP-0401DL below the 0.050 quality control limit for the compounds acetone and 2-butanone. This noncompliance affects positive and nondetected results. Positive results are qualified as estimated (J) and nondetected results are qualified as unreliable (UR).

The RRF10 values for the samples 003-TWP-0801, 003-TWP-0801DL, 003-TW-07001, 003-TW-07001DL, 003-TB-02901, 003-TB-03001, 003-TB-03101 and 003-TWDP-104 were below the 0.050 quality control limit for the compounds acetone, 2-butanone and 2-hexanone. This noncompliance affects positive and nondetected results. Positive results are qualified as estimated (J) and nondetected results are qualified as unreliable (UR).

The RRF10 values for the samples 003-TB-03201, 003-TB-03301, 003-TWDP-104DL, 003-TWP-1001, 003-TWP-0401 and 003-TWP-0401DL were below the 0.050 quality control limit for the compounds acetone, 2-butanone and 2-hexanone. This noncompliance affects positive and nondetected results. Positive results are qualified as estimated (J) and nondetected results are qualified as unreliable (UR).

The continuing calibration analysis of cis-1,3-dichloropropene and trans-1,3-dichloropropene contained percent differences (%Ds) greater than the 25% quality control limit. Nondetected results for the compounds in samples 003-TWP-0801, 003-TWP-0801DL, 003-TWP-07001, 003-TWP-07001DL, 003-TB-02901, 003-TB-03001, 003-TB-03101 and 003-TWDP-104 were qualified as estimated (UJ).

The following contaminants were detected in the field quality control blank VBLKF1 analyses at the maximum concentrations indicated:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
Methylene chloride	7.1 µg/kg	71 µg/kg

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The samples affected were: 003-TWP-0801DL, 003-TWO-07001, 003-TW-07001DL, 003-TB-02901, 003-TB-03001, 003-TB-03101 and 003-TWDP-104.

The following contaminants were detected in the field quality control blank VBLKU1 analyses at the maximum concentrations indicated:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
Methylene chloride	6 µg/L	60 µg/L

MEMO TO: M. SLADIC
 DATE: October 21, 1997 - PAGE 3

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The samples affected were: 003-SBP-0801, 003-SBP-0803, 003-SB-07001, 003-SB-07003, 00-SBP-1001, 003-SBP-1003, 003-SBDP-106, 003-SBP-0401, 003-SBP-0403, 003-SB0-3301 and 003-SB-03303.

Samples 003-TW-070-01DL, 003-TW-DP1-04DL, 003-TW-04-01DL and 003-TW-P08-01DL were discarded except for the compounds that were diluted for, which replaced the original run compounds.

Semivolatile Fraction

The continuing calibration analysis of pyridine contained a %D above the 25% quality control limit. Nondetected results for the compound in samples 003-TWP-0801, 003-TWDP-104 and 003-TWP-1001 were qualified as estimated (UJ).

The continuing calibration analysis of pyridine and bis(2-chloroisopropyl) contained %Ds above the 25% quality control limit. Nondetected results for the compounds in samples 003-TW-07001 and 003-TWP-0401 were qualified as estimated (UJ).

The continuing calibration analysis of pyridine and bis(2-chloroisopropyl)ether contained %Ds above the 25% quality control limit. Nondetected results for the compounds in sample 003-SB-03301 were qualified as estimated (UJ).

The following contaminants were detected in the field quality control blank SBLKD1 analyses at the maximum concentrations indicated:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
bis(2-ethylhexyl)phthalate	1 µg/L	10 µg/L

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The samples affected were: 003-TWP-0801, 003-TWP-1001, 003-TWD-P104, 003-TWP-7001 and 003-TWP-0401.

The following contaminants were detected in the field quality control blank SBLKD2 analyses at the maximum concentrations indicated:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
bis(2-ethylhexyl)phthalate	27 µg/kg	270 µg/kg

MEMO TO: M. SLADIC
DATE: October 21, 1997 - PAGE 4

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The samples affected were: 003-SBP-0801, 003-SBP-0803, 003-SB0-7001, 003-SB0-7003, 003-SBP-1001, 003-SBP-1003, 003-SBD-P106, 003-SBP-0401, 003-SBP-0403 and 003-SB0-3303.

The following contaminants were detected in the field quality control blank SBLKD3 analyses at the maximum concentrations indicated:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
bis(2-ethylhexyl)phthalate	22 µg/L	220 µg/L

Sample aliquot and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The sample affected was: 003-SB0-3301.

The surrogate recovery for 2,4,6-tribromophenol contained a percent recovery below the quality control limit in sample 003-SB0-3301. Since only one surrogate was noncompliant in the acid fraction, no qualifications were required.

Sample 003-TW-P10-01 was reanalyzed at a 1000 fold dilution. It's corresponding field duplicate was analyzed undiluted.

PCB Fraction

No noncompliances were found in this fraction.

MEMO TO: M. SLADIC
DATE: October 21, 1997 - PAGE 5

Executive Summary

Laboratory Performance: The volatile and herbicide fractions had noncompliant initial calibration %RSDs. Some volatile and semivolatile continuing calibration %Ds were outside the quality control limits. Holding times were exceeded in some volatile fractions. Calibrations were run in exceedance of the 12 hour time limit for some semivolatile fractions.

Other Factors Affecting Data Quality: Low internal standard areas were reported for several volatile and semivolatile fractions.

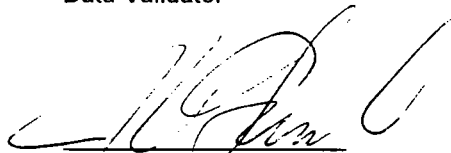
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", August 1993 NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 8/93).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Daniel J Menicucci
Data Validator



Brown and Root Environmental
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLAY
SDG NO. BRF 11**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile	Semivolatile	PCB
003-TB-029-01	J ¹ R ^{1,2}		
003-TB-030-01	J ¹ R ^{1,2}		
003-TB-031-01	J ¹ R ^{1,2}		
003-TB-032-01	J ⁴ R ^{1,2}		
003-TB-033-01	R ^{1,2}		
003-TW-070-01	J ^{1,4} R ^{1,2}	A ² J ³	
003-TW-P04-01	J ⁴ R ^{1,2}	A ² J ^{3,4}	
003-TW-P08-01	J ^{1,4} R ^{1,2}	A ² J ²	
003-TW-P10-01	J ⁴ R ^{1,2}	A ² J ²	
003-TW-DP1-04	A ¹ J ^{1,4} R ^{1,2}	A ² J ²	
003-SB-033-01	A ¹	A ² J ^{3,4}	
003-SB-033-03	A ¹	A ²	
003-SB-070-01	J ⁴ A ¹	A ²	
003-SB-070-03	J ⁴ A ¹	A ²	
003-SB-P04-01	J ⁴ A ¹	A ²	
003-SB-P04-03	J ⁴ A ¹	A ²	
003-SB-P08-01	J ⁴ A ¹	A ²	
003-SB-P08-03	J ⁴ A ¹	A ²	
003-SB-P10-01	J ⁴ A ¹	A ²	
003-SB-DP1-06	J ⁴ A ¹	A ²	
003-SB-P10-03	J ⁴ A ¹	A ²	

- A¹ - Accept data, but change positive methylene chloride result to a revised reporting limit as a result of blank contamination.
- A² - Accept data, but change positive bis(2-ethylhexyl)phthalate result to a revised reporting limit as a result of blank contamination.
- J¹ - Accept data, but qualify nondetected results as estimated (UJ), as a result of percent differences for cis-1,3-dichloropropene and trans-1,3-dichloropropene exceeding the 25% quality control limit in the continuing calibration.
- J² - Accept data, but qualify nondetected results as estimated (UJ), as a result of a percent difference for the continuing calibration of compound pyridine exceeding the 25% quality control limit.
- J³ - Accept data, but qualify nondetected results as estimated (UJ), as a result of a percent difference for the continuing calibration of compounds pyridine and bis(2-chloroisopropyl)ether exceeding the 25% quality control limit.
- J⁴ - Accept data, but qualify positive results as estimated (J) as a result of values below the reporting limit.

- R¹ - Reject nondetected results (UR) and qualify positive results as estimated (J) for the compounds acetone and 2-butanone as a result of the initial and continuing calibration RRFs falling below the 0.050 quality control limit.
- R² - Reject nondetected results (UR) for 2-hexanone as a result of the continuing calibration RRF falling below the 0.050 quality control limit.

Data Qualifier Key:

- U - Value is a nondetect as reported by the laboratory or qualified as a result of blank contamination, and should not be considered present.
- UR - Nondetected results is rejected due to poor Relative Response Factor.
- UJ - Undetected result is considered estimated due to various technical noncompliances, or the result was below the CRQL.
- J - Positive result is considered estimated due to various technical noncompliances, or the result was below the CRQL.
- B - Positive result is considered a false positive due to blank contamination.

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

<u>Fraction</u>	<u>Named TIC</u>
Volatile	Undecane Dodecane unknown hydrocarbon unknown substituted Benzene
Semivolatile	unknown alkane unknown hydrocarbon unknown Benzaldehyde, decamethyl- Phenon, thyl Benzoic Acid, methyl

TO: MR. MARK SLADIC **DATE: JANUARY 28, 1998**
FROM: LINDA KARSONOVICH **COPIES: DV FILE**
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF12

SAMPLES: 7/Soil/

003-SB-P11-01	003-SB-029-02
003-SB-P11-03	003-SB-028-01
003-SB-DP1-07	003-SB-028-02
003-SB-029-01	

10/Aqueous/

003-TB-034-01	003-TB-036-01
003-TB-035-01	003-TB-037-01
003-TW-033-01	003-TW-P11-01
003-AB-004-01	003-BB-007-01
003-TW-029-01	003-TW-028-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF12 consists of seven (7) solid environmental samples, six (6) aqueous environmental samples and four (4) field quality control blanks. All of the samples were analyzed for Target Compound List (TCL) volatile organic compounds. The environmental samples were also analyzed for TCL semivolatile organic compounds and polychlorinated biphenyls (PCBs). The trip blanks (designated -TB-) were analyzed for volatile compounds only. The field crew designated samples for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. One field duplicate sample pair was included within this SDG.

The samples were collected by Brown and Root Environmental on September 8th, 9th, 15th, and 16th, 1997 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- * • Surrogate spike recoveries
- * • Matrix Spike/Matrix Spike Duplicate Results
- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial calibration and/or continuing calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results reported in the affected samples were qualified as estimated, (J) and rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for trans-1,3-dichloropropene, bromoform, and chloroethane. Positive and nondetected results are affected by these noncompliances. Positive and nondetected results were qualified as estimated, (J) and (UJ), in the affected samples.

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	6 µg/Kg	60 µg/Kg
Methylene Chloride*	2 µg/L	20 µg/L
Toluene	1 µg/Kg	10 µg/Kg
Toluene*	0.9 µg/L	9 µg/L
Acetone*	3.2 µg/L	32 µg/L / 32 µg/Kg

Samples affected: All

- Contaminant detected in a field quality control blank

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for methylene chloride, acetone, and toluene were qualified in the manner indicated by the blank action table. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

A water sample was not designated for matrix spike/matrix spike duplicate analysis on the chain of custody sheets and was not performed for this SDG. The laboratory did perform a blank spike/blank spike duplicate analysis for water.

Dilutions were performed on samples 003-TW-028-01 (20X), 003-TW-033-01 (4X), and 003-TW-P11-01 (2X and 4X)). The compounds trans-1,2-dichloroethene and trichloroethene in sample 003-TW-028-01 were above the linear range of the instrument. The results from the dilution for these compounds only were transcribed over to the undiluted sample results. The compound 1,1,1-trichloroethane in sample 003-TW-033-01 was above the linear range of the instrument. The result from the dilution, for this compound only, was transcribed over to the undiluted sample results. Sample 003-TW-P11-01 was diluted 10X and sample results were reported from this dilution. An additional dilution (20X) was required to bring the compound, trichloroethene, into the linear range of the instrument. The result for trichloroethene only was transcribed over to the 10X sample results.

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for pyridine, bis(2-chloroisopropyl)ether, and hexachlorocyclopentadiene. Positive and nondetected results reported for the aforementioned target compounds in the affected samples were qualified as estimated, (J) and (UJ).

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	33 µg/Kg	330 µg/Kg
Bis(2-ethylhexyl)phthalate	7 µg/L	70 µg/L

Samples affected: All.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate were qualified in the manner indicated by the blank action table.

A water sample was not designated for matrix spike/matrix spike duplicate analysis on the chain of custody sheets and was not performed for this SDG. The laboratory did perform a blank spike/blank spike duplicate analysis for water.

Sample 003-SB-028-01 was diluted 10 times. Detection limits are elevated accordingly.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs and %Ds outside than their respective quality control limits were reported for several volatile and semivolatile compounds. Bis(2-ethylhexyl)phthalate, methylene chloride, toluene, and acetone were detected in the laboratory method blanks and/or field quality control blanks.

Other Factors Affecting Data Quality: None.


The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF12

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PCB
003-TB-034-01	R ¹ J ⁶		
003-TB-035-01	R ¹ J ⁶		
003-TB-036-01	R ¹ J ^{2,6}		
003-TB-037-01	R ¹ J ^{2,6}		
003-TW-033-01	A ¹ R ¹ J ⁶	A ² J ³	
003-TW-P11-01	A ¹ R ¹ J ⁶	A ² J ³	
003-AB-004-01	A ¹ R ¹	A ² J ^{3,6}	
003-BB-007-01	A ¹ R ¹	A ² J ^{4,6}	
003-TW-029-01	A ¹ R ¹ J ^{2,6}	A ²	
003-TW-028-01	A ¹ R ¹ J ^{2,6}	A ²	
003-SB-P11-01	A ¹	A ² J ⁵	
003-SB-P11-03	A ¹	A ² J ⁵	
003-SB-DP1-07	A ¹	A ³ J ⁵	
003-SB-029-01	A ¹ J ^{1,6}	A ² J ^{5,6}	
003-SB-029-02	A ¹ J ^{1,6}	A ² J ⁵	
003-SB-028-01	A ¹ J ^{1,6}	A ³ J ⁶	
003-SB-028-02	A ¹ J ¹	A ² J ⁶	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but replace positive results for methylene chloride, acetone, and/or toluene with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank and/or field quality control blank contamination.
- A² - Accept data, but replace positive results for bis(2-ethylhexyl)phthalate with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A¹ - Accept data, but qualify positive results which exceed the blank action level as estimated, (J).
- R¹ - Reject data, qualify nondetected results for acetone, 2-butanone, and 2-hexanone as rejected, (UR) and qualify positive results as estimated, (J).
- J¹ - Accept data, but qualify positive and nondetected results for chloroethane as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J² - Accept data, but qualify positive and nondetected results for trans-1,3-dichloropropene and bromoform as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J³ - Accept data, but qualify positive and nondetected results for pyridine and bis(2-chloroisopropyl)ether as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J⁴ - Accept data, but qualify positive and nondetected results for pyridine, hexachlorocyclopentadiene, and bis(2-chloroisopropyl)ether as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J⁵ - Accept data, but qualify positive and nondetected results for pyridine as estimated, (J) and (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.

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DATE: JUNE 16, 1997 - PAGE 6

J⁵ - Accept data, but qualify positive results less than the CRQL as estimated, (J).

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown(s)
	undecane
	acetic acid, butyl ester
	dodecane
	hydrocarbon
	substituted benzene
	1H-Indene isomer
Semivolatile	Unknown(s)
	hydrocarbon
	PAH
	alkane
	benzene, substituted (C5-)
	Naphthalene, dimethyl
	Naphthalene, trimethyl
	Dibenzothiophene
	Dibenzothiophene, methyl
	Phenanthrene, methyl
	Phenanthrene, dimethyl



C-49-12-7-052

DATE: DECEMBER 3, 1997

COPIES: DV FILE

SAMPLES: 4/Soils/

003-SB-029-02

003-BB-007-01

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 2

C-49-12-7-052

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	22 mg/L	110 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Notes

Samples 003-SB-029-01 and 003-SB-029-02 were digested for hexavalent chromium outside of the contract required hold time. However, no validation actions are required for this noncompliance.

Executive Summary

Laboratory Performance: Total organic carbon was present in the laboratory method blank.

Other Factors Affecting Data Quality: None.


MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 3


C-49-12-7-052

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 4

C-49-12-7-052

NIROP FRIDLEY
SDG BRF12

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent.chromium	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



C-49-12-7-027

DATE: DECEMBER 2, 1997

COPIES: DV FILE

**SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF12**

SAMPLES: 7/Soils/
003-SB-028-01 003-SB-028-02 003-SB-029-01 003-SB-029-02
003-SB-P11-01 003-SB-DP1-07 003-SB-P11-03

6/Aqueous/ 003-AB-004-01 003-TW-033-01	003-BB-007-01 003-TW-P11-01	003-TW-028-01	003-TW-029-01
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Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF12, consists of seven (7) soil environmental samples and six (6) aqueous environmental samples. One (1) field duplicate pair (003-SB-P11-01 / 003-SB-DP1-07) was included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by P and Root Environmental on September 8, 9, 15 and 16, 1997 and analyzed by Laucks Testing Laboratories, Inc. Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • Laboratory Duplicate Results
- Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- * • GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
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C-49-12-7-027

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level (aqueous)	Action Level (soil)
aluminum ⁽¹⁾	5.560 mg/kg	NA	27.8 mg/kg
barium	2.6 ug/L	13.0 ug/L	2.6 mg/kg
beryllium	0.3 ug/L	1.5 ug/L	0.3 mg/kg
calcium	50.3 ug/L	251.5 ug/L	50.3 mg/kg
copper ⁽²⁾	4.500 ug/L	22.5 ug/L	NA
iron	11.5 ug/L	57.5 ug/L	11.5 mg/kg
magnesium	38.9 ug/L	194.5 ug/L	38.9 mg/kg
manganese	1.5 ug/L	7.5 ug/L	1.5 mg/kg
sodium	37.4 ug/L	NA	37.4 mg/kg
sodium ⁽²⁾	44.50 ug/L	222.5 ug/L	NA
thallium	1.9 ug/L	9.5 ug/L	1.9 mg/kg
vanadium	2.5 ug/L	12.5 ug/L	2.5 mg/kg
zinc ⁽¹⁾	1.380 mg/kg	NA	6.90 mg/kg
zinc ⁽²⁾	4.100 ug/L	20.50 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for beryllium, calcium, copper, sodium, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, beryllium, calcium, iron, magnesium, manganese, sodium, vanadium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and cyanide affecting the soil matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %R for selenium affecting the aqueous matrix was < 30% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR". The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

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DATE: DECEMBER 2, 1997 - PAGE 3

C-49-12-7-027

Field Duplicate Results

Field duplicate imprecision was noted for soil sample pair, 003-SB-P11-01 / 003-SB-DP1-07, for copper. The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for arsenic were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-028-02 and 003-TW-028-01. The positive results reported for arsenic in the affected samples were qualified as estimated, "J".

The GFAA Post Digestion Spike Recovery for lead was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-BB-007-01. The nondetected result reported for lead in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-P11-01 and 003-SB-028-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-033-01. The nondetected result reported for thallium in the affected sample was qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the QA Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for mercury and manganese were outside the 80-120% quality control limit. However, no validation actions are required as per Region V guidance.

The Matrix Spike %R for mercury affecting the soil matrix was > 125% quality control limit. However, no validation actions were required as all results reported for the aforementioned analyte in the affected samples were nondetects.

The GFAA Post Digestion Spike Recovery for selenium was < 75% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-P11-01. However, no validation actions are required as the result reported for selenium in the affected sample was rejected as a result of a more severe noncompliance.

The GFAA Post Digestion Spike Recoveries for thallium were < 75% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-P11-03 and 003-SB-028-01. However, no validation actions are required as the results reported for thallium in the affected samples were qualified as blank contamination.

MEMO TO: M. SLADIC
DATE: DECEMBER 2, 1997 - PAGE 4

C-49-12-7-027

Executive Summary

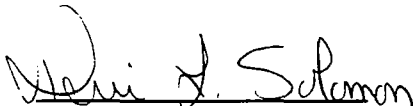
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

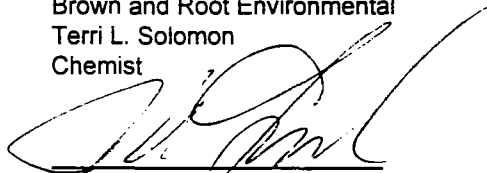
Other Factors Affecting Data Quality: The MS %Rs for antimony and cyanide affecting the soil matrix were < 75% quality control limit. The MS %R for selenium affecting the aqueous matrix was < 30% quality control limit. Field duplicate imprecision was noted for copper. The GFAA Post Digestion Spike Recoveries for arsenic (samples 003-SB-028-02 and 003-TW-028-01), lead (sample 003-BB-007-01), selenium (samples 003-SB-P11-01 and 003-SB-028-01) and thallium (sample 003-TW-033-01) were outside the 85-115% quality control limits.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
SDG BRF12
TABLE 1 - RECOMMENDATION SUMMARY

aluminum		J ¹	magnesium		J ¹	
antimony		J ²	manganese		J ¹	
arsenic		J ⁵	mercury			
barium		J ¹	nickel			
beryllium	A ¹	J ¹	potassium			
cadmium			selenium		J ^{3,5}	R ¹
calcium	A ¹	J ¹	silver			
chromium			sodium	A ¹	J ¹	
cobalt			thallium	A ¹	J ⁵	
copper	A ¹	J ⁴	vanadium	A ¹	J ¹	
iron		J ¹	zinc	A ¹	J ¹	
lead		J ⁵	cyanide		J ²	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects affecting the soil matrix as estimated, "J" and respectively, as a result of low MS %R.
- J³ - Accept data but qualify positive results affecting the aqueous matrix as estimated, "J", as a result of low MS %R.
- J⁴ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of field duplicate imprecision.
- J⁵ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", as a result of GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results affecting the aqueous matrix, "UR", as a result of extremely low MS %R.



C-49-12-7-029

003-TW-P11-F1

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 2

C-49-12-7-029

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
barium	2.6 ug/L	13.0 ug/L
beryllium	0.3 ug/L	1.5 ug/L
calcium	50.3 ug/L	251.5 ug/L
copper ⁽¹⁾	4.500 ug/L	22.5 ug/L
iron	5.0 ug/L	25.0 ug/L
magnesium	38.9 ug/L	194.5 ug/L
manganese	1.1 ug/L	5.5 ug/L
sodium ⁽¹⁾	44.5 ug/L	222.5 ug/L
thallium	1.9 ug/L	9.5 ug/L
vanadium	2.5 ug/L	12.5 ug/L
zinc ⁽¹⁾	4.100 ug/L	20.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contaminants. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for copper, thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for barium, calcium, iron, magnesium, manganese and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for arsenic was > 125% quality control limit. Positive results reported for the aforementioned analyte were qualified as estimated, "J".

The MS %R for selenium was < 30% quality control limit. Nondetected results reported for the aforementioned analyte were qualified as rejected, "UR". The positive results reported for the aforementioned analyte were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for arsenic were > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P11-F1 and 003-TW-028-F1. The positive results reported for arsenic in the affected samples were qualified as estimated, "J".

MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 3

C-49-12-7-029

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for manganese was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-033-F1. However, no validation actions were required as the result reported for arsenic in the affected sample was a nondetect.

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-P11-F1 and 003-TW-028-F1. However, no validation actions were required as the results reported for selenium in the affected samples were qualified for a more severe noncompliance.

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-029-F1. However, no validation actions were required as the result reported for thallium in the affected sample was qualified as blank contamination.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %R for arsenic was > 125% quality control limit. The MS %R for selenium was < 30% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (samples 003-TW-P11-F1 and 003-TW-028-F1) were > 115% quality control limit.

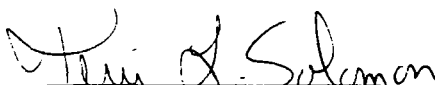
MEMO TO: M. SLADIC
DATE: DECEMBER 3, 1997 - PAGE 4

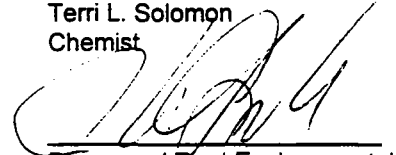
C-49-12-7-029

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

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C-49-12-7-029

NIROP FRIDLEY
 SDG BRF12D
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹	
antimony		manganese	J ¹	
arsenic	J ^{2,3}	mercury		
barium	J ¹	nickel		
beryllium		potassium		
cadmium		selenium	J ²	R ¹
calcium	J ¹	silver		
chromium		sodium	J ¹	
cobalt		thallium	A ¹	
copper	A ¹	vanadium	A ¹	
iron	J ¹	zinc	A ¹	
lead				

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results as estimated, "J", as a result of MS %R.
- J³ - Accept data but qualify positive results as estimated, "J", as a result of GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results, "UR", as a result of extremely low MS %R.



C-49-12-7-069

DATE: DECEMBER 4, 1997

COPIES: DV FILE

SAMPLES: 2/Soils/

003-SB-071-01 003-SB-071-03

003-AB-006-01 003-BB-008-01

The attached Table 1 summarizes the validation recommendations which were based on the following information:

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DATE: DECEMBER 4, 1997 - PAGE 2

C-49-12-7-069

Executive Summary

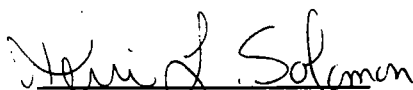
Laboratory Performance: None.

Other Factors Affecting Data Quality: None.

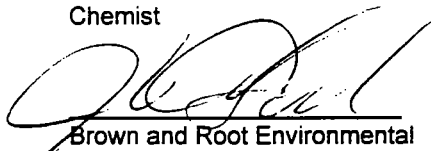
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 3

C-49-12-7-069

NIROP FRIDLEY
SDG BRF13

TABLE 1 - RECOMMENDATION SUMMARY

Hexavalent chromium

If the field is left blank, the qualifier is A - Accept all data.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-12-7-056

TO: M. SLADIC DATE: DECEMBER 4, 1997
FROM: TERRI L. SOLOMON COPIES: DV FILE
SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF13

SAMPLES: 4/Soils/
003-SB-071-01 003-SB-071-03 003-SB-P05-01 003-SB-P05-02
7/Aqueous/
003-AB-005-01 003-BB-008-01 003-TW-026-01 003-TW-046-01
003-TW-068-01 003-TW-071-01 003-TW-P05-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF13, consists of four (4) soil environmental samples and seven (7) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on September 17, 18, 19, 20, 21, and 22, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - Laboratory Duplicate Results
 - ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Method of Standard Addition
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

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C-49-12-7-056

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level (aqueous)	Action Level (soil)
aluminum ⁽¹⁾	5.560 mg/kg	NA	27.8 mg/kg
iron	11.5 ug/L	57.5 ug/L	11.5 mg/kg
manganese	1.5 ug/L	7.5 ug/L	1.5 mg/kg
sodium	37.4 ug/L	187 ug/L	NA
sodium ⁽¹⁾	6.120 mg/kg	NA	30.6 mg/kg
zinc ⁽¹⁾	1.380 mg/kg	NA	6.9 mg/kg
zinc ⁽²⁾	6.600 ug/L	33.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for manganese, sodium and zinc have been qualified as nondetected. Positive results greater than the action level for aluminum, iron, manganese, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for antimony affecting the soil matrix was < 75% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

The MS %Rs for lead and manganese affecting the soil matrix were > 125% quality control limit. The positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

The MS %R for selenium affecting the aqueous matrix was < 30% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as rejected, "UR". The positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for calcium and magnesium affecting the soil matrix. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for barium affecting the soil matrix was > 10% quality control limit. The positive results reported for the aforementioned analyte were qualified as estimated, "J".

MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 3

C-49-12-7-056

The ICP Serial Dilution Percent Difference (%D) for barium affecting the aqueous matrix was > 10% quality control limit. The positive results reported for the aforementioned analyte were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-P05-01, 003-SB-071-01, 003-SB-071-03 and 003-SB-P05-02. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-046-01, 003-TW-068-01 and 003-SB-071-03. The nondetected results reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for mercury was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-071-01, 003-TW-026-01 and 003-TW-068-01. However, no validation actions are required as the results reported for selenium in the affected samples were rejected as a result of a more severe noncompliance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %R for antimony affecting the soil matrix was < 75% quality control limit. The MS %Rs for lead and manganese affecting the soil matrix were > 125% quality control limit. The MS %R for selenium affecting the aqueous matrix was < 30% quality control limit. Laboratory duplicate imprecision was noted for calcium and magnesium affecting the soil matrix. The ICP Serial Dilution %Ds for barium affecting the soil and aqueous matrix were > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-SB-P05-01, 003-SB-071-01, 003-SB-071-03 and 003-SB-P05-02) and thallium (samples 003-TW-046-01, 003-TW-068-01 and 003-SB-071-03) were < 85% quality control limit.

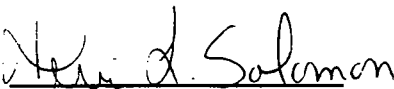
MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 4

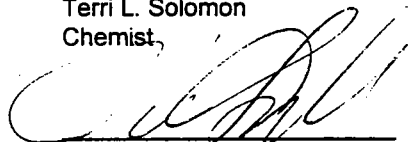
C-49-12-7-056

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
SDG BRF13
TABLE 1 - RECOMMENDATION SUMMARY

aluminum	J ¹	magnesium		J ⁵
antimony	J ²	manganese	A ¹	J ^{1,3}
arsenic		mercury		
barium	J ⁶	nickel		
beryllium		potassium		
cadmium		selenium		J ^{4,7} R ¹
calcium	J ⁵	silver		
chromium		sodium	A ¹	J ¹
cobalt		thallium		J ⁷
copper		vanadium		
iron	J ¹	zinc	A ¹	J ¹
lead	J ³	cyanide		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results affecting the soil matrix as estimated, "UJ", as a result of low MS %R.
- J³ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of high MS %R.
- J⁴ - Accept data but qualify positive results affecting the aqueous matrix as estimated, "J", as a result of low MS %R.
- J⁵ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of laboratory duplicate imprecision.
- J⁶ - Accept data but qualify positive results as estimated, "J" and "UJ", respectively, as a result of ICP Serial Dilution %Ds.
- J⁷ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.
- R¹ - Reject nondetected results affecting the aqueous matrix, "UR", as a result of extremely low MS %R.

C-49-11-7-032

TO: MR. MARK SLADIC DATE: NOVEMBER 10, 1997

FROM: BONNI J. SMATHERS COPIES: DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003 NIROP, FRIDLEY, MINNESOTA
SDG BRF13

SAMPLES: 4/Solid/
003-SB-071-01 003-SB-071-03 003-SB-P05-01
003-SB-P05-02
9/Aqueous/
003-TB-038-01 003-TB-039-01 003-AB-005-01
003-BB-008-01 003-TW-026-01 003-TW-046-01
003-TW-068-01 003-TW-071-01 003-TW-P05-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley SDG BRF13 consists of four (4) solid environmental samples, five (5) aqueous samples, two (2) trip blanks, one (1) bubble blank, and one (1) aqueous blank. All samples were analyzed for Target Compound List (TCL) organics (volatile, semivolatile, and PCB compounds). A field duplicate pair was not included in this SDG. Sample 003-TW-046-01 was designated by the field crew for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses.

The samples were collected by Brown and Root Environmental on September 17th through September 22nd, 1997 and analyzed by Laucks Testing Labs. All samples were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria, using Contract Laboratory Program (CLP) Statement of Work (SOW) 8260A for aqueous volatile samples and OLM0.3.1 analytical and reporting protocols for all other analyses. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- * • Internal Standard Performance
- * • Matrix spike results
- * • Blank spike results
- * • Compound Identification
- * • Compound quantitation
- * • Detection limits
- * • Tentatively identified compounds

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The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial and Continuing Calibration Relative Response Factors (RRFs) for acetone and 2-butanone were less than 0.050. This noncompliance indicates a lack of instrument response. Positive and nondetected results are affected by this noncompliance. Positive results reported for these compounds were qualified as estimated, (J). Nondetected results reported for these compounds in the affected samples were considered unreliable and were rejected, (UR).

Continuing Calibration Relative Response Factors (RRFs) for 2-hexanone were less than 0.05. This noncompliance indicates a lack of instrument response and affects both positive and nondetected results. Therefore, nondetected results reported for 2-hexanone were considered unreliable and were rejected, (UR), in the affected samples.

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for bromoform, chloroethane, and trans-1,3-dichloropropene. Positive and nondetected results are affected by these noncompliances. Therefore, nondetected results reported for the aforementioned compounds were qualified as estimated, (UJ), in the affected samples.

The following contaminants were detected in the low level laboratory method blanks and field quality control blanks analyzed in this SDG:

Blanks	Maximum Concentration	Action Level
Acetone*	8.1 ug/L	81 ug/L
Methylene chloride*	2.3 ug/L	23 ug/L
Methylene chloride	9 ug/kg	90 ug/kg
Toluene	1 ug/kg	5 ug/kg
Toluene	0.9 ug/L	4.5 ug/L

Samples affected: All samples.

- Maximum concentration detected in a field quality control blank.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for methylene chloride and toluene. No actions were necessary for acetone as no positive results were reported for this compound in the affected samples. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

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The Matrix Spike/Matrix Spike Duplicate analysis of sample 003-TW-046-01 yielded high %Rs for trichloroethene. Therefore, positive results for trichloroethene were qualified as estimated, (J) in sample 003-TW-046-01.

Semivolatiles

Continuing calibration Percent Differences (%Ds) greater than the 25% quality control limit were reported for 3,3'-dichlorobenzidine. Positive and nondetected results are affected by these noncompliances. Therefore, nondetected results for the 3,3'-dichlorobenzidine were qualified as estimated, (UJ), in the affected samples.

The following contaminant was detected in the low level laboratory method blanks and field quality control blanks analyzed in this SDG:

<u>Blanks</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
bis(2-ethylhexyl)phthalate*	1 ug/L	5 ug/L
bis(2-ethylhexyl)phthalate	30 ug/kg	300 ug/kg
diethylphthalate	1 ug/L	5 ug/L
di-n-butyl phthalate	130 ug/kg	1300 ug/kg
di-n-butyl phthalate*	1 ug/L	5 ug/L
di-n-octyl phthalate	45 ug/kg	450 ug/kg

Samples affected: All samples.

* - Maximum concentration detected in a field quality control blank.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level: report value as estimated, (J).

Dilution factors, percent moisture and sample aliquot were taken into consideration during the application of all action levels. Actions as indicated above were taken for bis(2-ethylhexyl)phthalate and di-n-butyl phthalate. No action was taken for di-n-octyl and diethylphthalate as no positive results were reported in the affected samples. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The dilution analysis of sample 003-TW-026-01 reported a high surrogate Percent Recovery (%R) for 2,4,6-tribromophenol. No action was taken since the original analysis of sample 003-TW-026-01 was chosen for validation and since only one fractional surrogate was noncompliant.

The Matrix Spike/Matrix Spike Duplicate analysis yielded high %Rs for 4-nitrophenol in sample 003-TW-046-01 and low %Rs for pentachlorophenol in sample 003-SB-P05-01. Action was taken to quality nondetected results for pentachlorophenol as estimated, (UJ), in sample 003-SB-P05-01.

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DATE: NOVEMBER 10, 1997 - PAGE 4
PCBs

Continuing calibration Percent Differences (%Ds) greater than the 25% quality control limit were reported for Aroclor 1016 and Aroclor 1260. Positive and nondetected results are affected by this noncompliance. No action was taken, however, since no samples were associated with these noncompliances.

No additional problems were noted with the pesticide fraction.

Additional Comments

Positive results for ethylbenzene, o-xylene, and trichloroethene were reported at concentrations which exceeded the linear calibration range of the instrument in samples 003-TW-026-01. Sample 003-TW-068-01 reported positive results for cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trichloroethene which exceeded the linear calibration range of the instrument. As a result, the laboratory reanalyzed these samples at a dilution. The original analyses, with the exception of the exceeded results, were used in validation. The results for the aforementioned compounds from the diluted analysis were transposed over the original results and used in validation.

A positive result for naphthalene was reported at a concentration which exceeded the linear calibration range of the instrument in sample 003-TW-026-01. Consequently, the laboratory reanalyzed this sample at a dilution. The original analysis, with the exception of the exceeded results, were used in validation. The result for the naphthalene from the diluted analysis was transposed over the original results and used in validation.

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY


Laboratory Performance Issues: **Laboratory Performance Issues:** An initial calibration %RSD greater than the 30% quality control limit was reported for the volatile compound acetone. Initial Calibration RRFs less than 0.050 were reported for acetone and 2-butanone. Continuing Calibration RRFs were reported for 2-hexanone. Continuing calibration %Ds greater than the 25% quality control limit were reported for several volatile and semivolatile compounds. Methylene chloride and toluene were detected in the volatile laboratory method blanks. Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected in the semivolatile laboratory method blank.

Other Factors Affecting Data Quality: Poor Matrix Spike/Matrix Spike Duplicate results were reported in both the volatile and semivolatile fraction. A poor surrogate recovery was reported in the semivolatile fraction. No additional problems were noted.

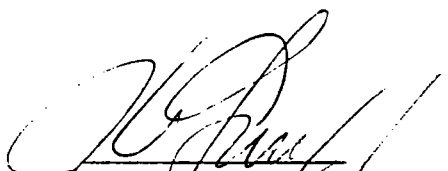
MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 10, 1997 - PAGE 5

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), US EPA Region V Standard Operating Procedures for Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental

Bonni J. Smathers
Industrial Hygienist/Data Validator


Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF13

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA			SVOA		PCB
003-SB-071-01	A ¹	J ^{3,5}		A ³	J ⁴	
003-SB-071-03	A ¹	J ^{3,5}		A ²	J ⁴	
003-SB-P05-01	A ¹	J ^{3,5}		A ³	J ^{4,7}	
003-SB-P05-02	A ¹	J ⁵		A ³	J ⁴	
003-AB-005-01		J ²	R ^{1,2,3}	A ³	J ⁶	
003-BB-008-01		J ^{1,2}	R ^{2,3}	A ³	J ^{4,5}	
003-TB-038-01		J ^{1,2,5}	R ^{2,3}	A ³	J ⁵	
003-TB-039-01		J ^{2,5}	R ^{1,2,3}	A ³	J ⁵	
003-TW-026-01	A ⁴	J ^{2,5}	R ^{1,2,3}	A ^{3,5}	J ⁶	
003-TW-046-01		J ^{2,5,6}	R ^{1,2,3}	A ³		
003-TW-068-01		J ^{2,5}	R ^{1,2,3}	A ³		
003-TW-071-01		J ²	R ^{1,2,3}	A ³	J ⁶	
003-TW-P05-01		J ²	R ^{1,2,3}	A ³		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but raise the detection limit for methylene chloride and qualify results as nondetected, (U), as a result of laboratory blank contamination.
- A² - Accept data, but raise the detection limit for di-n-butyl phthalate and qualify results as as nondetected, (U), as a result of laboratory blank contamination.
- A³ - Accept data, but raise the detection limit for bis(2-ethylhexyl)phthalate and qualify results as nondetected, (U), as a result of laboratory blank contamination.
- A⁴ - Accept data, but raise the detection limit for toluene and qualify results as nondetected, (U), as a result of laboratory blank contamination.
- A⁵ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of an initial response factor less than 0.05.
- J² - Accept data, but qualify nondetected results for bromoform and trans-1,3-dichloropropene as estimated, (UJ), as a result of continuing calibration %Ds greater than 25%.
- J³ - Accept data, but qualify nondetected results for chloroethane as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.

MEMO TO: MR. MARK SLADIC
DATE: NOVEMBER 10, 1997 - PAGE 7

- J⁴ - Accept data, but qualify nondetected results for 3,3'-dichlorobenzidine as estimated, (UJ), as a result of a continuing calibration %D greater than 25%.
- J⁶ - Accept data, but qualify positive results as estimated, (J), as a result of a value below the CRQL.
- J⁶ - Accept data, but qualify positive results for trichloroethene as estimated, (J), as a result of a high MS/MSD %R.
- J⁷ - Accept data, but qualify nondetected results for pentachlorophenol as estimated, (UJ), as a result of a low MS/MSD %R.
- R¹ - Reject data and qualify nondetected results for acetone as unreliable, (UR), as a result of initial and continuing calibration RRFs less than 0.050.
- R² - Reject data and qualify nondetected results for 2-butanone as unreliable, (UR), as a result of initial and continuing calibration RRFs less than 0.050.
- R³ - Reject data and qualify nondetected results for 2-hexanone as unreliable, (UR), as a result of continuing calibration RRFs less than 0.050.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	Unknown(s)
Semivolatile	Unknown(s)



C-49-12-7-064

TO:	M. SLADIC	DATE:	DECEMBER 4, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - DISSOLVED TAL METALS CTO 003 - NIROP FRIDLEY SDG -BRF13b		

SAMPLES: 5/Aqueous/

003-TW-026-F1	003-TW-046-F1	003-TW-068-F1	003-TW-071-F1
003-TW-P05-F1			

The sample set for CTO 003, NIROP Fridley, SDG BRF13^D, consists of five (5) aqueous environmental samples. No field duplicate pairs were included within this SDG.

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on September 17, 18, 19, 20 and 21, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - * • Laboratory Duplicate Results
 - ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Method of Standard Addition
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 2

C-49-12-7-064

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
iron	11.5 ug/L	57.5 ug/L
manganese	1.5 ug/L	7.5 ug/L
sodium	37.4 ug/L	187 ug/L
zinc ⁽¹⁾	6.600 ug/L	33.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for zinc have been qualified as nondetected "U". Positive results greater than the action level iron, manganese and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Positive results and nondetects reported for the aforementioned analyte were qualified as estimated, "J" and "UJ", respectively.

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for barium was > 10% quality control limit. Positive results reported for the aforementioned analyte were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-071-F1, 003-TW-026-F1 and 003-TW-068-F1. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-068-F1. The nondetected result reported for thallium in the affected sample was qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 3

C-49-12-7-064

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for mercury was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The ICP Serial Dilution %D for barium was > 10% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-071-F1, 003-TW-026-F1 and 003-TW-068-F1) and thallium (sample 003-TW-068-F1) were < 85% quality control limit.

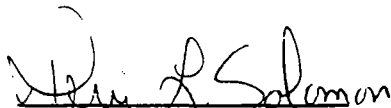
MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 4

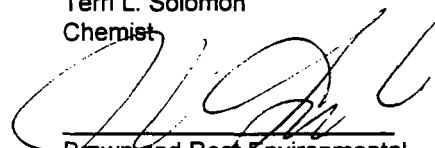
C-49-12-7-064

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: DECEMBER 4, 1997 - PAGE 5

C-49-12-7-064

NIROP FRIDLEY
 SDG BRF13
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	
antimony		manganese	J ¹
arsenic		mercury	
barium	J ³	nickel	
beryllium		potassium	
cadmium		selenium	J ^{2,4}
calcium		silver	
chromium		sodium	J ¹
cobalt		thallium	J ⁴
copper		vanadium	
iron	J ¹	zinc	A ¹
lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of MS %R.
- J³ - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D.
- J⁴ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.



C-49-12-7-207

TO: M. SLADIC **DATE: DECEMBER 29, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL ORGANIC CARBON, HEXAVALENT CHROMIUM
CTO 003 - NIROP FRIDLEY
SDG - BRF14

SAMPLES: 8/Soils/

003-SB-015-01	003-SB-015-03	003-SB-046-01	003-SB-046-03
003-SB-068-01	003-SB-068-03	003-SB-DP1-08	003-SB-DP1-09

The sample set for CTO 003, NIROP Fridley, SDG BRF14, consists of eight (8) soil environmental samples. Two (2) field duplicate pairs (003-SB-046-01 / 003-SB-DP1-08 and 003-SB-015-01 / 003-SB-DP1-09) were included within this SDG.

All samples were analyzed for total organic carbon. Samples 003-SB-015-01, 003-SB-015-03, 003-SB-046-01, 003-SB-046-03, 003-SB-DP1-08 and 003-SB-DP1-09 were also analyzed for hexavalent chromium. The samples were collected by Brown and Root Environmental on September 19, 21 and 22, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Total organic carbon analyses were conducted using Lloyd Kahn Method. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • Laboratory Control Sample Results
- * • Matrix Spike Results
- * • Laboratory Duplicate Results
- * • Detection Limits
- * • Sample Quantitation

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 2

C-49-12-7-207

Laboratory Blank Results

The following contaminant was detected in the laboratory method blank at the following maximum concentration:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (soil)</u>
total organic carbon	22 mg/L	110 mg/kg

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for total organic carbon have been qualified as estimated, "J".

Executive Summary

Laboratory Performance: Total organic carbon was present in the laboratory method blank.

Other Factors Affecting Data Quality: None.

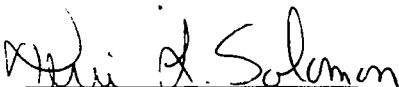
MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 3

C-49-12-7-207

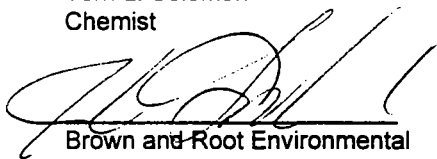
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Terri L. Solomon
Chemist



Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 4

C-49-12-7-207

NIROP FRIDLEY
SDG BRF14

TABLE 1 - RECOMMENDATION SUMMARY

Total organic carbon	J ¹
Hexavalent chromium	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-6-226

TO: M. SLADIC

DATE: NOVEMBER 5, 1997

FROM: DANIEL MENICUCCI

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - TCL VOAs, SVOAs, & PCBs
CTO 003, NIROP FRIDLAY
SDG BRF 14

SAMPLES: 12/Soil

003-SB-015-01	003-SB-015-03	003-SB-026-01	003-SB-026-03
003-SB-046-01	003-SB-046-03	003-SB-047-01	003-SB-047-03
003-SB-068-01	003-SB-068-03	003-SB-DP1-08	003-SB-DP1-09

8/Aqueous

003-TB-040-01	003-TB-041-01	003-TB-042-01	003-TB-043-01
003-TB-044-01	003-TW-015-01	003-TW-047-01	003-TW-DP1-05

The sample set for the CTO 003 NIROP Fridley site, SDG BRF 14, consists of twelve (12) soil and eight (8) aqueous environmental samples. All samples were analyzed for Target Compound List (TCL) volatile, semivolatile and PCB organic compounds. The field crew specified sample 003-SB-046-01 for matrix spike and matrix spike duplicate analysis.

The samples were collected by Brown & Root Environmental from September 19th - 23rd, 1997 and analyzed by Laucks Testing Labs. Soil samples were analyzed using CLP Method OLM03.1 analytical reporting protocol. The aqueous samples were analyzed using SW-846 Method 8260A. The data was evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- Surrogate spike recoveries
- Matrix Spike / Matrix Spike Duplicate Analyses
- * • Laboratory control sample results
- Internal standard performance
- * • Sample quantitation
- Tentatively Identified Compounds

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: M. SLADIC
DATE: November 5, 1997 - PAGE 2

Volatile Fraction

The initial calibration affecting low level aqueous samples contained average relative response factors below the 0.050 quality control limit for the compounds acetone and 2-butanone. This noncompliance affects both positive and nondetected results. Positive results are qualified as estimated (J) and nondetected results are qualified as unreliable (UR).

The continuing calibration affecting all low level aqueous samples contained relative response factors for acetone, 2-butanone and 2-hexanone below the 0.050 quality control limit. This noncompliance affected nondetected results which were qualified as unreliable (UR).

A continuing calibration affecting all low level aqueous samples contained percent differences greater than the +/- 25% quality control limit for the compounds trans-1,3-dichloropropene and bromoform. This noncompliance affected nondetected results which were qualified as estimated (UJ).

A continuing calibration affecting all low level soil samples contained a percent difference greater than the +/- 25% quality control limit for chloroethane. This noncompliance affected nondetected results, which were qualified as estimated (UJ).

The following contaminants were detected in the laboratory method and field quality control blank at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
Methylene Chloride	12 ug/kg	120 ug/kg
Toluene	1 ug/Kg	5 ug/Kg

Sample aliquot percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U".

The internal standards bromochloromethane, 1,4-difluorobenzene and chlorobenzene-d5 were below the quality control limit in sample 003-SB-DP1-09. The sample was subsequently reanalyzed, however the reanalysis was performed outside of the technical holding time so the original analysis was chosen for data validation. This noncompliance affects both positive and nondetected results, which are qualified as estimated (J) and (UJ) respectively.

Samples 003-TW-047-01 and 003-TW-DP1-05 were diluted because the compounds cis-1,2-dichloroethene, trans-1,2-dichloroethene and trichloroethene exceeded the linear calibration curve for the instrument. The diluted samples were discarded except for the compounds that were diluted for which replaced the original compounds.

MEMO TO: M. SLADIC
DATE: November 5, 1997 - PAGE 3

Semivolatile Fraction

The MSD surrogate recovery for sample 003-TW-DP1-05 contained a matrix spike and matrix spike duplicate recovery for the compound 4-Nitrophenol above the quality control limit.

The relative percent difference (RPD) for the MS/MSD analysis of sample 003-SB-046-01 contained values for the compounds 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol and acenaphthene above the quality control limit. No action was taken as a result of this noncompliance.

The following contaminants were detected in the laboratory method and field quality control blank at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
di-n-butylphthalate	130 ug/Kg	1300 ug/Kg
bis(2-ethylhexyl)phthalate	30 ug/Kg	300 ug/Kg
di-n-octylphthalate	45 ug/Kg	450 ug/Kg
bis(2-ethylhexyl)phthalate	2 ug/L	20 ug/L

Sample aliquot percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U".

The surrogate recovery for sample 003-SB-068-01 contained values for 2,4,6-tribromophenol above the quality control limit. No action was taken since only one fractional surrogate was outside of the quality control limit.

PCB Fraction

The percent difference between columns for sample 003-SB-047-01 exceeded the 25% quality control limit for the compound aroclor-1254. Positive results were qualified as estimated (J).

MEMO TO: M. SLADIC
DATE: November 5, 1997 - PAGE 4

Executive Summary

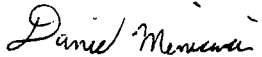
Laboratory Performance: RRFs for acetone, 2-butanone and 2-hexanone failed to meet minimum criterion in aqueous calibrations. Several volatile compounds failed calibration percent difference criterion. Blank contamination was noted in several volatile and semivolatile samples.

Other Factors Affecting Data Quality: Low internal standard areas were reported for several volatile fractions.

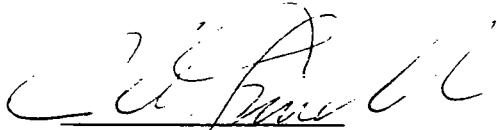
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", August 1993 NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 8/93).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Daniel J Menicucci
Data Validator



Brown and Root Environmental
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF 14**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile	Semivolatile	PCB
003-SB-015-01	A ¹ J ^{2,6}	A ²	
003-SB-015-03	A ¹ J ^{2,6}	A ²	
003-SB-026-01	A ¹ J ^{2,6}	A ^{2,3}	
003-SB-026-03	A ¹ J ^{2,6}	A ^{2,3}	
003-SB-046-01	A ¹ J ^{2,6}	A ^{2,3} J ⁶	
003-SB-046-03	A ¹ J ^{2,6}		
003-SB-047-01	A ¹ J ^{2,6}	A ^{2,3} J ^{4,5}	
003-SB-047-03	A ¹ J ^{2,6}	A ^{2,3}	
003-SB-068-01	A ¹ J ^{2,6}	A ²	
003-SB-068-03	A ¹ J ^{2,6}	A ^{2,3}	
003-SB-DP1-08	A ¹ J ^{2,6}		
003-SB-DP1-09	A ¹ J ^{2,3,6}	A ²	
003-TB-040-01	A ¹ J ^{1,6} R ^{1,2}		
003-TB-041-01	A ¹ J ^{1,6} R ^{1,2}		
003-TB-042-01	A ¹ J ^{1,6} R ^{1,2}		
003-TB-043-01	A ¹ J ¹ R ^{1,2}		
003-TB-044-01	A ¹ J ^{1,6} R ^{1,2}		
003-TW-015-01	A ¹ J ^{1,6} R ^{1,2}	A ² J ⁶	
003-TW-047-01	A ¹ J ¹ R ^{1,2}	A ² J ⁶	
003-TW-DP1-05	A ¹ J ¹ R ^{1,2}	J ⁴	

- A¹ - Accept data, but change positive methylene chloride and/or toluene result to a revised reporting limit as a result of blank contamination.
- A² - Accept data, but change positive bis(2-ethylhexyl)phthalate result to a revised reporting limit as a result of blank contamination.
- A³ - Accept data, but change positive di-n-butylphthalate and di-n-octylphthalate results to a revised reporting limit as a result of blank contamination.
- J¹ - Accept data, but qualify undetected results as estimated (UJ) as a result of a percent difference for the continuing calibration of compounds trans-1,3-dichloropropene and/or bromoform exceeding the 25% quality control limit.
- J² - Accept data, but qualify undetected results as estimated (UJ) as a result of a percent difference for the continuing calibration of compound chloroethane exceeding the 25% quality control limit.
- J³ - Accept data, but qualify positive results as estimated (J) and nondetected results as estimated (UJ), as a result of the internal standards bromochloromethane, 1,4-difluorobenzene and chlorobenzene-d5 falling below the quality control limit.
- J⁴ - Accept data, but qualify nondetected results as estimated (UJ) as a result of the matrix spike / matrix spike duplicate noncompliance for the compound 4-nitrophenol.

- J⁵ - Accept data, but qualify positive results as estimated (J) as a result of %Ds exceeding the 25% quality control limit for Aroclor-1254.
- J⁶ - Accept data, but qualify positive results below the CRQL as estimated (J).
- R¹ - Nondetected results are qualified as unreliable (UR) and positive results are qualified as estimated (J) for the compounds acetone and 2-butanone as a result of the average relative response factor falling below the 0.050 quality control limit.
- R² - Nondetected results are qualified as unreliable (UR) for the compound 2-hexanone as a result of the RRF value falling below the 0.050 quality control limit.

Data Qualifier Key:

- | | | |
|----|---|---|
| U | - | Value is a nondetect as reported by the laboratory or qualified as a result of blank contamination, and should not be considered present. |
| UR | - | Nondetected results is rejected due to poor Relative Response Factor. |
| UJ | - | Undetected result is considered estimated due to various technical noncompliances, or the result was below the CRQL. |
| J | - | Positive result is considered estimated due to various technical noncompliances, or the result was below the CRQL. |
| BU | - | Positive result is considered a false positive due to blank contamination. |

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

Fraction

Semivolatile

Named TIC

unknown
unknown alkane
unknown hydrocarbon
unknown organic acid
unknown phthalate
cholesterol
benzene, substituted (C4)-



C-49-12-7-198

DATE: DECEMBER 24, 1997

COPIES: DV FILE

**SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRE14**

SAMPLES:	12/Soils/			
	003-SB-015-01	003-SB-015-03	003-SB-026-01	003-SB-026-03
	003-SB-046-01	003-SB-046-03	003-SB-047-01	003-SB-047-03
	003-SB-068-01	003-SB-068-03	003-SB-DP1-08	003-SB-DP1-09

3/Aqueous/
003-TW-015-01 003-TW-047-01 003-TW-DP1-05

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF14, consists of twelve (12) soil environmental samples and three (3) aqueous environmental samples. Three (3) field duplicate pairs (003-SB-046-01 / 003-SB-DP1-08, 003-SB-015-01 / 003-SB-DP1-09 and 003-TW-047-01 / 003-TW-DP1-05) were included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Brown and Root Environmental on September 19, 20, 21, 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- * • Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- * • GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: DECEMBER 4, 1997 - PAGE 2

C-49-12-7-198

- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>	<u>Action Level (soil)</u>
arsenic	1.9 ug/L	9.5 ug/L	1.9 mg/kg
iron	6.1 ug/L	30.5 ug/L	6.1 mg/kg
manganese	1.3 ug/L	6.5 ug/L	1.3 mg/kg
nickel ⁽¹⁾	5.100 ug/L	25.5 ug/L	NA
sodium ⁽¹⁾	56.300 ug/L	281.5 ug/L	NA
sodium ⁽²⁾	7.880 mg/kg	NA	39.4 mg/kg
zinc ⁽¹⁾	9.500 ug/L	47.5 ug/L	NA
zinc ⁽²⁾	1.340 mg/kg	NA	6.7 mg/kg

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for arsenic, nickel, sodium and zinc have been qualified as nondetected. Positive results greater than the action level for arsenic, iron, manganese, sodium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony, lead and selenium affecting the soil matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %Rs for selenium and thallium affecting the aqueous matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for chromium, lead and magnesium affecting the soil matrix. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

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C-49-12-7-198

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-015-01, 003-SB-046-01, 003-SB-046-03, 003-SB-026-01, 003-SB-026-03, 003-SB-068-01, 003-SB-068-03, 003-SB-015-01, 003-SB-015-03, 003-SB-DP1-09, 003-SB-047-01, 003-SB-047-03, 003-SB-DP1-08, 003-TW-047-01, 003-TW-DP1-05 and 003-TW-015-01. The positive results and nondetects reported for selenium in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-SB-046-01, 003-SB-046-03, 003-SB-DP1-08, 003-SB-026-01, 003-SB-026-03, 003-SB-068-01, 003-SB-068-03, 003-SB-015-01, 003-SB-015-03, 003-SB-047-01, 003-TW-047-01 and 003-TW-DP1-05. The positive results and nondetects reported for thallium in the affected samples were qualified as estimated, "J" and "UJ", respectively.

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for chromium was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recoveries for arsenic was > 125% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-015-01. However, no validation actions are required as the result reported for arsenic in the affected sample was nondetected.

A comparison of field duplicate pairs, 003-SB-046-01 / 003-SB-DP1-08, 003-SB-015-01 / 003-SB-DP1-09 and 003-TW-047-01 / 003-TW-DP1-05, is contained in Appendix C.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony, lead and selenium affecting the soil matrix were < 75% quality control limit. The MS %Rs for selenium and thallium affecting the aqueous matrix were < 75% quality control limit. Laboratory duplicate imprecision was noted for chromium, lead and magnesium affecting the soil matrix. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-015-01, 003-SB-046-01, 003-SB-046-03, 003-SB-026-01, 003-SB-026-03, 003-SB-068-01, 003-SB-068-03, 003-SB-015-01, 003-SB-015-03, 003-SB-DP1-09, 003-SB-047-01, 003-SB-047-03, 003-SB-DP1-08, 003-TW-047-01, 003-TW-DP1-05 and 003-TW-015-01) and thallium (samples 003-SB-046-01, 003-SB-046-03, 003-SB-DP1-08, 003-SB-026-01, 003-SB-026-03, 003-SB-068-01, 003-SB-068-03, 003-SB-015-01, 003-SB-015-03, 003-SB-047-01, 003-TW-047-01 and 003-TW-DP1-05) were < 85% quality control limit.


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C-49-12-7-198

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon,
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: DECEMBER 24, 1997 - PAGE 5

C-49-12-7-198

NIROP FRIDLEY
 SDG BRF14

TABLE 1 - RECOMMENDATION SUMMARY

aluminum				magnesium	J ⁴
antimony		J ²		manganese	J ¹
arsenic	A ¹	J ¹		mercury	
barium				nickel	A ¹
beryllium				potassium	
cadmium				selenium	J ^{2,3,5}
calcium				silver	
chromium		J ⁴		sodium	A ¹ J ¹
cobalt				thallium	J ^{3,5}
copper				vanadium	
iron		J ¹		zinc	A ¹ J ¹
lead		J ^{2,4}		cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects affecting the soil matrix as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J³ - Accept data but qualify positive results and nondetects affecting the aqueous matrix as estimated, "J" and "UJ", respectively, as a result of low MS %R.
- J⁴ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of laboratory duplicate imprecision.
- J⁵ - Accept data but qualify positive results and nondetects results as estimated, "J" and "UJ", respectively, as a result of GFAA Post Digestion Spike Recoveries.



INTERNAL CORRESPONDENCE

C-49-12-7-206

TO: M. SLADIC **DATE: DECEMBER 29, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - DISSOLVED TAL METALS
CTO 003 - NIROP FRIDLEY
SDG -BRF14 D

SAMPLES: 3/Aqueous/

003-TW-015-F1 003-TW-047-F1 003-TW-DP1-F5

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF14^D, consists of three (3) aqueous environmental samples. One (1) field duplicate pair (003-TW-047-F1 / 003-TW-DP1-F5) was included within this SDG.

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on September 22 and 23, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - * • Laboratory Duplicate Results
 - * • ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Method of Standard Addition
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
arsenic	5.7 ug/L	28.5 ug/L
iron	6.1 ug/L	30.5 ug/L
manganese	1.3 ug/L	6.5 ug/L
nickel ⁽¹⁾	5.100 ug/L	25.5 ug/L
sodium ⁽¹⁾	56.3 ug/L	281.5 ug/L
zinc ⁽¹⁾	9.5 ug/L	47.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for nickel and zinc have been qualified as nondetected "U". Positive results greater than the action level for iron, manganese and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for selenium and thallium were < 75% quality control limit. Positive results and nondetects reported for the aforementioned analytes were qualified as estimated, "J" and "UJ", respectively.

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-047-F1 and 003-TW-DP1-F5. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-015-F1, 003-TW-047-F1 and 003-TW-DP1-F5. The nondetected result reported for thallium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for chromium was < 80% quality control limit. However, no validation actions are required as per Region V guidance.

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 3

C-49-12-7-206

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-015-F1. However, no validation actions were required as the sample result was nondetected.

Executive Summary

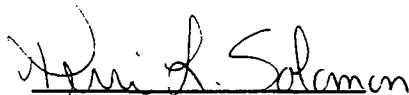
Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

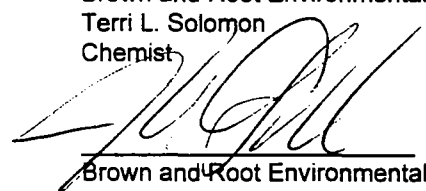
Other Factors Affecting Data Quality: The MS %Rs for selenium and thallium were < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for selenium (samples 003-TW-047-F1 and 003-TW-DP1-F5) and thallium (samples 003-TW-015-F1, 003-TW-047-F1 and 003-TW-DP1-F5) were < 85% quality control limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: DECEMBER 29, 1997 - PAGE 4

C-49-12-7-206

NIROP FRIDLEY
 SDG BRF14

TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	
antimony		manganese	J ¹
arsenic		mercury	
barium		nickel	A ¹
beryllium		potassium	
cadmium		selenium	J ^{2,3}
calcium		silver	
chromium		sodium	J ¹
cobalt		thallium	J ^{2,3}
copper		vanadium	
iron	J ¹	zinc	A ¹
lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of MS %R.
- J³ - Accept data but qualify nondetected results as estimated, "UJ", as a result of GFAA Post Digestion Spike Recoveries.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-6-226

TO: M. SLADIC

DATE: NOVEMBER 6, 1997

FROM: DANIEL MENICUCCI

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - TCL VOAs, SVOAs, & PCBs
CTO 003, NIROP FRIDLEY
SDG BRF 15

SAMPLES: 5/Soil

003-SB-039-01	003-SB-039-03	003-SB-050-01	003-SB-050-02
003-SB-DP1-10			

4/Aqueous

003-TB-045-01	003-TB-046-01	003-TW-039-01	003-TW-050-01
---------------	---------------	---------------	---------------

The sample set for the CTO 003 NIROP Fridley site, SDG BRF 15, consists of five (5) soil and four (4) aqueous environmental samples. All samples were analyzed for Target Compound List (TCL) volatile, semivolatile and PCB organic compounds. The field crew specified sample 003-SB-050-02 for matrix spike and matrix spike duplicate analysis.

The samples were collected by Brown & Root Environmental from September 24th - 25th, 1997 and analyzed by Laucks Testing Labs. Soil samples were analyzed using CLP Method OLM03.1 analytical reporting protocol. The aqueous samples were analyzed using SW-846 Method 8260A. The data was evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Matrix Spike / Matrix Spike Duplicate Analyses
- * • Laboratory control sample results
- * • Internal standard performance
- * • Sample quantitation
- Tentatively Identified Compounds

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: M. SLADIC
 DATE: November 6, 1997 - PAGE 2

Volatile Fraction

The initial calibration affecting all low level aqueous samples contained average relative response factors below the 0.050 quality control limit for the compounds acetone and 2-butanone. Nondetected results are qualified as unreliable (UR).

The continuing calibration affecting all low level aqueous samples contained relative response factors for 2-hexanone below the 0.050 quality control limit. This noncompliance affected nondetected results which were qualified as unreliable (UR).

The continuing calibration affecting all low level aqueous samples contained percent differences greater than the +/- 25% quality control limit for the compounds trans-1,3-dichloropropene and bromoform. This noncompliance affected nondetected results which were qualified as estimated (UJ).

The following contaminants were detected in the laboratory method and field quality control blank at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
Methylene Chloride	9 ug/Kg	90 ug/Kg

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for these compounds found below the Contract Required Quantitation Limit (CRQL) have been deleted and replaced by the CRQL value, then qualified as undetected, "U". Positive results were qualified as estimated (J). The samples affected were all of the low level aqueous samples.

Sample 003-TW-039-01 was diluted because it had values for cis-1,2-dichloroethene and trichloroethene that exceeded the calibration curve for the instrument. The undiluted sample was used over the diluted sample except for the compounds that exceeded the limit.

Sample 003-TW-050-01 was diluted because it had values for cis-1,2-dichloroethene, trans-1,2-dichloroethene and trichloroethene that exceeded the calibration curve for the instrument. The undiluted sample was used over the diluted sample except for the compounds that exceeded the limit.

Semivolatile Fraction

The following contaminants were detected in the laboratory method and field quality control blank at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action-Level</u>
bis(2-ethylhexyl)phthalate	13 ug/Kg	130 ug/Kg
bis(2-ethylhexyl)phthalate	1 ug/L	10 ug/L

Sample aliquot, percent solids and dilution factors were considered prior to the application of all action levels. Positive results for this compound found below the Contract Required Quantitation Limit (CRQL) has been replaced by the CRQL value and qualified as nondetected, "U".

MEMO TO: M. SLADIC
DATE: November 6, 1997 - PAGE 3

Positive results were qualified as estimated (J).

PCB Fraction

No noncompliances were found in this fraction.

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DATE: November 6, 1997 - PAGE 4

Executive Summary

Laboratory Performance: The volatile fractions had noncompliant continuing calibration %Ds. Blank contamination was noted in several volatile and semivolatile samples.

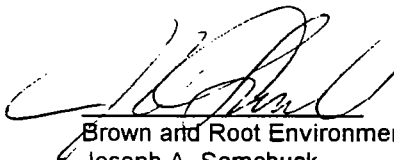
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", August 1993 NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 8/93).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental
Daniel J Menicucci
Data Validator



Brown and Root Environmental
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY
SDG NO. BRF 15

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile	Semivolatile	PCB
003-SB-039-01	J ² A ¹	J ² A ²	
003-SB-039-03	J ² A ¹	A ²	
003-SB-050-01	J ² A ¹	A ²	
003-SB-050-02	J ² A ¹	A ²	
003-SB-DP1-10	J ² A ¹	A ²	
003-TB-045-01	J ¹ R ^{1,2}		
003-TB-046-01	J ¹ R ^{1,2}		
003-TW-039-01	J ^{1,2} R ^{1,2}	A ²	
003-TW-050-01	J ^{1,2} R ^{1,2}	A ²	

- A¹ - Accept data, but change positive methylene chloride result to a revised reporting limit as a result of blank contamination.
- A² - Accept data, but change positive bis(2-ethylhexyl)phthalate result to a revised reporting limit as a result of blank contamination.
- J¹ - Accept data, but qualify undetected results as estimated (UJ) as a result of a percent difference for the continuing calibration of compounds trans-1,3-dichloropropene and bromoform exceeding the 25% quality control limit.
- J² - Accept data, but qualify positive results below the CRQL as estimated (J).
- R¹ - Undetected results are qualified as unreliable (UR) for the compounds acetone and 2-butanone as a result of the average relative response factor falling below the quality control limit.
- R² - Undetected results are qualified as unreliable (UR) for the compound 2-hexanone as a result of the RRF value falling below the quality control limit.

Data Qualifier Key:

- | | | |
|----|---|---|
| U | - | Value is a nondetect as reported by the laboratory or qualified as a result of blank contamination, and should not be considered present. |
| UR | - | Nondetected results is rejected due to poor Relative Response Factor. |
| UJ | - | Undetected result is considered estimated due to various technical noncompliances, or the result was below the CRQL. |
| J | - | Positive result is considered estimated due to various technical noncompliances, or the result was below the CRQL. |
| B | - | Positive result is considered a false positive due to blank contamination. |

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

Fraction

Volatile

Semivolatile

Named TIC

Undecane

Dodecane

unknown

unknown organic acid

unknown alkane



C-49-12-7-212

TO:	M. SLADIC	DATE:	DECEMBER 29, 1997
FROM:	TERRI L. SOLOMON	COPIES:	DV FILE
SUBJECT:	INORGANIC DATA VALIDATION - HEXAVALENT CHROMIUM CTO 003 - NIROP FRIDLEY SDG - BRF15		

SAMPLES: 5/Soils/

003-SB-039-01 003-SB-039-03 003-SB-050-01 003-SB-DP1-10
003-SB-050-02

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF15, consists of five (5) soil environmental samples. One (1) field duplicate pair (003-SB-050-01 / 003-SB-DP1-10) was included within this SDG.

All samples were analyzed for hexavalent chromium. The samples were collected by Brown and Root Environmental on September 24 and 25, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Hexavalent chromium analyses were conducted using SW-846 methods 3060A/7196A.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - * • Laboratory Blank Analyses
 - * • Laboratory Control Sample Results
 - * • Matrix Spike Results
 - * • Laboratory Duplicate Results
 - * • Field Duplicate Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 2

C-49-12-7-212

Executive Summary


Laboratory Performance: None.


Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 3

C-49-12-7-212

NIROP FRIDLEY
SDG BRF15

TABLE 1 - RECOMMENDATION SUMMARY

Hexavalent chromium

If the field is left blank, the qualifier is A - Accept all data.



C-49-12-7-208

TO: M. SLADIC **DATE: DECEMBER 29, 1997**

FROM: TERRI L. SOLOMON **COPIES: DV FILE**

SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF15

SAMPLES:	5/Soils/			
	003-SB-039-01	003-SB-039-03	003-SB-050-01	003-SB-050-02
	003-SB-DP1-10			
	2/Aqueous/			
	003-TW-039-01	003-TW-050-01		

The sample set for CTO 003, NIROP Fridley, SDG BRF15, consists of five (5) soil environmental samples and two (2) aqueous environmental samples. One (1) field duplicate pair (003-SB-050-01 / 003-SB-DP1-10) was included within this SDG.

All samples were analyzed for Total Target Analyte List (TAL) metals and cyanide. The samples were collected by Br and Root Environmental on September 24 and 25, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analyses were conducted using cold vapor AA. Cyanide analyses were conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration Verifications
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- * • Laboratory Control Sample Results
- Matrix Spike Results
- Laboratory Duplicate Results
- Field Duplicate Results
- * • ICP Serial Dilution Results
- * • GFAA Percent Relative Standard Deviation Results
- GFAA Post Digestion Spike Recovery Results
- * • Method of Standard Addition
- * • Detection Limits
- * • Sample Quantitation

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 2

C-49-12-7-208

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level (aqueous)	Action Level (soil)
aluminum	43.0 ug/L	NA	43.0 mg/kg
aluminum ⁽²⁾	52.5 ug/L	262.5 ug/L	NA
barium	2.1 ug/L	10.5 ug/L	2.1 mg/kg
calcium	28.6 ug/L	143 ug/L	28.6 mg/kg
iron	10.0 ug/L	50.0 ug/L	NA
iron ⁽¹⁾	2.70 mg/kg	NA	13.5 mg/kg
magnesium	36.4 ug/L	182 ug/L	36.4 mg/kg
sodium	33.4 ug/L	NA	33.4 mg/kg
sodium ⁽²⁾	39.90 ug/L	199.5 ug/L	NA
thallium	1.6 ug/L	8.0 ug/L	1.6 mg/kg
vanadium	2.1 ug/L	10.5 ug/L	2.1 mg/kg
zinc ⁽¹⁾	1.380 mg/kg	NA	6.9 mg/kg
zinc ⁽²⁾	7.400 ug/L	37.0 ug/L	NA

Samples affected: All

⁽¹⁾ Maximum concentration present in a soil preparation blank.

⁽²⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for thallium, vanadium and zinc have been qualified as nondetected "U". Positive results greater than the action level for aluminum, barium, calcium, iron, magnesium, sodium, vanadium and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recoveries (%Rs) for antimony and lead affecting the soil matrix were < 75% quality control limit. The positive results and nondetects reported for the aforementioned analytes in the affected samples were qualified as estimated, "J" and "UJ", respectively.

The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. The nondetected results reported for the aforementioned analyte in the affected samples were qualified as estimated, "UJ".

Laboratory Duplicate Results

Laboratory duplicate imprecision was noted for calcium affecting the soil matrix. Positive results reported for the aforementioned analyte in the affected samples were qualified as estimated, "J".

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DATE: DECEMBER 29, 1997 - PAGE 3

C-49-12-7-208

Field Duplicate Results

Field duplicate imprecision was noted for barium, chromium and manganese for sample pair 003-SB-050-01 / 003-SB-DP1-10. Positive results reported for the aforementioned analytes in the affected samples were qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SB-050-02. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-050-01, 003-TW-039-01, 003-SB-050-01 and 003-SB-039-01. The nondetected results reported for selenium in the affected samples were qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, manganese and zinc were outside the 80-120% quality control limits. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for arsenic was > 125% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-039-01. However, no validation actions are required as result reported for arsenic in the affected sample was nondetected.

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-039-01. However, no validation actions are required as the result reported for thallium in the affected sample was qualified as blank contamination.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for antimony and lead affecting the soil matrix were < 75% quality control limit. The MS %R for selenium affecting the aqueous matrix was < 75% quality control limit. Laboratory duplicate imprecision was noted for calcium affecting the soil matrix. Field duplicate imprecision was noted for barium, chromium and manganese. The GFAA Post Digestion Spike Recoveries for arsenic (sample 003-SB-050-02) and selenium (samples 003-TW-050-01, 003-TW-039-01, 003-SB-050-01 and 003-SB-039-01) were outside the 85-115% quality control limits.

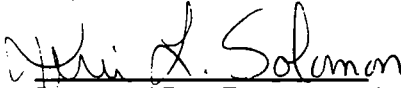
MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 4

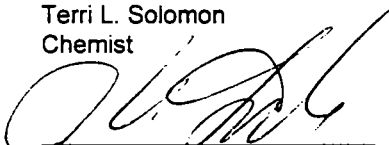
C-49-12-7-208

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
 DATE: DECEMBER 29, 1997 - PAGE 5

C-49-12-7-208

NIROP FRIDLEY
 SDG BRF15
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum	J ¹	magnesium	J ¹
antimony	J ²	manganese	J ⁵
arsenic	J ⁶	mercury	
barium	J ^{1,5}	nickel	
beryllium		potassium	
cadmium		selenium	J ^{3,6}
calcium	J ^{1,4}	silver	
chromium	J ⁵	sodium	J ¹
cobalt		thallium	A ¹
copper		vanadium	A ¹ J ¹
iron	J ¹	zinc	A ¹ J ¹
lead	J ²	cyanide	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects affecting the soil matrix as estimated, "J" and "U" respectively, as a result of low MS %R.
- J³ - Accept data but qualify nondetected results affecting the aqueous matrix as estimated, "UJ", as a result of low MS %R.
- J⁴ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of laboratory duplicate imprecision.
- J⁵ - Accept data but qualify positive results affecting the soil matrix as estimated, "J", as a result of field duplicate imprecision.
- J⁶ - Accept data but qualify positive results and nondetects results as estimated, "J" and "UJ", respectively, as a result of GFAA Post Digestion Spike Recoveries.



C-49-12-7-214

Overview

All samples were analyzed for dissolved Target Analyte List (TAL) metals. The samples were collected by Brown and Root Environmental on September 24 and 25, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - * • Laboratory Duplicate Results
 - * • ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Method of Standard Addition
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 2

C-49-12-7-214

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
aluminum ⁽¹⁾	52.5 ug/L	262.5 ug/L
barium	2.1 ug/L	10.5 ug/L
calcium	28.6 ug/L	143 ug/L
iron	9.9 ug/L	49.5 ug/L
magnesium	36.4 ug/L	182 ug/L
sodium ⁽¹⁾	39.9 ug/L	199.5 ug/L
thallium	1.6 ug/L	8.0 ug/L
vanadium	2.1 ug/L	10.5 ug/L
zinc ⁽¹⁾	7.400 ug/L	37.0 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the action level for vanadium and zinc have been qualified as nondetected "U". Positive results greater than action level for barium, calcium, iron, magnesium and sodium have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for selenium was < 75% quality control limit. Nondetected results reported for the aforementioned analyte were qualified as estimated, "UJ".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-039-F1. The positive result reported for arsenic in the affected sample was qualified as estimated, "J".

The GFAA Post Digestion Spike Recovery for lead was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-050-F1. The nondetected result reported for lead in the affected sample was qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for selenium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-050-F1 and 003-TW-039-F1. The nondetected result reported for selenium in the affected samples were qualified as estimated, "UJ".

The GFAA Post Digestion Spike Recoveries for thallium were < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in samples 003-TW-050-F1 and 003-TW-039-F1. The nondetected result reported for thallium in the affected samples were qualified as estimated, "UJ".

MEMO TO: M. SLADIC
DATE: DECEMBER 29, 1997 - PAGE 3

C-49-12-7-214

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

The Contract Required Detection Limit (CRDL) Percent Recoveries (%Rs) for lead, manganese and zinc were outside the 80-120% quality control limits. However, no validation actions are required as per Region V guidance.

The GFAA Post Digestion Spike Recovery for arsenic was > 115% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-TW-050-F1. However, no validation actions were required as the sample result was nondetected.

Executive Summary


Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

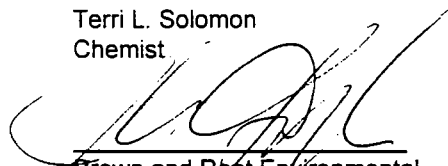
Other Factors Affecting Data Quality: The MS %R for selenium was < 75% quality control limit. The GFAA Post Digestion Spike Recoveries for arsenic (sample 003-TW-039-F1), lead (sample 003-TW-050-F1), selenium (samples 003-TW-050-F1 and 003-TW-039-F1) and thallium (samples 003-TW-050-F1 and 003-TW-039-F1) were outside the 85-115% quality control limits.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

NIROP FRIDLEY
 SDG BRF15
 TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	J ¹
antimony		manganese	
arsenic	J ³	mercury	
barium	J ¹	nickel	
beryllium		potassium	
cadmium		selenium	J ^{2,3}
calcium	J ¹	silver	
chromium		sodium	J ¹
cobalt		thallium	J ³
copper		vanadium	A ¹
iron	J ¹	zinc	A ¹
lead	J ³		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data but qualify as nondetected, "U", as a result of laboratory blank contamination.
- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify nondetected results as estimated, "UJ", respectively, as a result of MS %R.
- J³ - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of GFAA Post Digestion Spike Recoveries.

C-49-01-8-161

TO: M. SLADIC DATE: JANUARY 26, 1998
FROM: TERRI L. SOLOMON COPIES: DV FILE
SUBJECT: INORGANIC DATA VALIDATION - TOTAL TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF16
SAMPLES: 1/Aqueous/
003-SW-003-01

Overview

The sample set for CTO 003, NIROP Fridley, SDG BRF16, consists of one (1) aqueous environmental sample. No field duplicates were included within this SDG.

The sample was analyzed for Total Target Analyte List (TAL) metals and cyanide. The sample was collected by Brown and Root Environmental on October 27, 1997 and analyzed by Laucks Testing Laboratories, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) Statement of Work (SOW) ILM04.0.

All analyses, with the exception of arsenic, cyanide, lead, mercury, selenium and thallium were conducted using Inductively Coupled Plasma (ICP) methodologies. Arsenic, lead, selenium and thallium analyses were conducted using Graphite Furnace Atomic Absorption (GFAA) methodologies. Mercury analysis was conducted using cold vapor AA. Cyanide analysis was conducted using wet chemistry methods.

These data were evaluated based on the following parameters:

- * • Data Completeness
 - * • Holding Times
 - * • Calibration Verifications
 - Laboratory Blank Analyses
 - * • ICP Interference Check Sample Results
 - * • Laboratory Control Sample Results
 - Matrix Spike Results
 - * • Laboratory Duplicate Results
 - ICP Serial Dilution Results
 - * • GFAA Percent Relative Standard Deviation Results
 - GFAA Post Digestion Spike Recovery Results
 - * • Detection Limits
 - * • Sample Quantitation
- * - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

MEMO TO: M. SLADIC
DATE: JANUARY 26, 1998 - PAGE 2

C-49-01-8-161

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Blank Results

The following contaminants were detected in the laboratory method / preparation blanks at the following maximum concentrations:

<u>Analyte</u>	<u>Maximum Concentration</u>	<u>Action Level (aqueous)</u>
antimony	19.6 ug/L	98.0 ug/L
barium	1.8 ug/L	9.0 ug/L
iron	13.0 ug/L	65.0 ug/L
selenium	1.2 ug/L	6.0 ug/L
zinc ⁽¹⁾	11.1 ug/L	55.5 ug/L

Samples affected: All

⁽¹⁾ Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the action level for barium, iron and zinc have been qualified as estimated, "J".

Matrix Spike Results

The Matrix Spike (MS) Percent Recovery (%R) for iron was > 125% quality control limit. The positive result reported for the aforementioned analyte was qualified as estimated, "J".

The MS %R for cyanide was < 75% quality control limit. The nondetected result reported for the aforementioned analyte in was qualified as estimated, "UJ".

ICP Serial Dilution Results

The ICP Serial Dilution Percent Difference (%D) for manganese was > 10% quality control limit. The positive result reported for the aforementioned analyte was qualified as estimated, "J".

GFAA Post Digestion Spike Recovery Results

The GFAA Post Digestion Spike Recovery for thallium was < 85% quality control limit and the sample absorbance was < 50% of the post digestion spike absorbance in sample 003-SW-003-01. The nondetected result reported for thallium in the affected sample was qualified as estimated, "UJ".

Notes

The Instrument Detection Limits (IDLs) for antimony, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, sodium, thallium and zinc reported for this SDG were greater than the IDLs provided by the laboratory in the Quality Assurance Project Plan (QAPP). All other analytes were either less than or equal to the provided IDLs.

MEMO TO: M. SLADIC
DATE: JANUARY 26, 1998 - PAGE 3

C-49-01-8-161

The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for silver was < 80% quality control limits. However, no validation actions are required as per Region V guidance.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: The MS %Rs for iron and cyanide were outside the 75-125% quality control limits.. Laboratory duplicate imprecision was noted for calcium affecting the soil matrix. The ICP Serial Dilution %D for manganese was > 10%. The GFAA Post Digestion Spike Recovery for thallium (sample 003-SW-003-01) was < 85% quality control limit.


MEMO TO: M. SLADIC
DATE: JANUARY 26, 1998 - PAGE 4

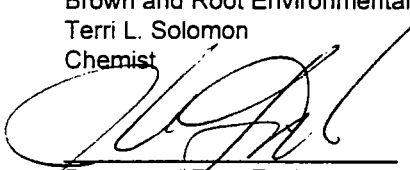
C-49-01-8-161

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994, "EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Review", September 1993 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown and Root Environmental
Terri L. Solomon
Chemist


Brown and Root Environmental
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

MEMO TO: M. SLADIC
DATE: JANUARY 26, 19987 - PAGE 5

C-49-01-8-161

NIROP FRIDLEY
SDG BRF16
TABLE 1 - RECOMMENDATION SUMMARY

aluminum		magnesium	
antimony		manganese	
arsenic		mercury	
barium	J ¹	nickel	
beryllium		potassium	
cadmium		selenium	
calcium		silver	
chromium		sodium	
cobalt		thallium	J ⁴
copper		vanadium	
iron	J ^{1,2}	zinc	J ¹
lead		cyanide	J ²

If the field is left blank, the qualifier is A - Accept all data.

- J¹ - Accept data but qualify positive results in exceedance of the laboratory blank action level result as estimated, "J".
- J² - Accept data but qualify positive results and nondetects as estimated, "J" and "UJ", respectively, as a result of MS %R.
- J³ - Accept data but qualify positive results as estimated, "J", as a result of ICP Serial Dilution %D.
- J⁴ - Accept data but qualify nondetected results as estimated, "UJ", a result of GFAA Post Digestion Spike Recoveries.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

TO: MR. MARK SLADIC

DATE: DECEMBER 22, 1997

FROM: LINDA KARSONOVICH

COPIES: DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF16

SAMPLES: 4/Aqueous

003-TB-04801
003-BB-00901

003-TB-04901
003-SW-00301

10/Soil/

003-SB-30D-01
003-SB-30D-03
003-SB-30D-05
003-SB-30D-07
003-SB-30D-09

003-SB-30D-02
003-SB-30D-04
003-SB-30D-06
003-SB-30D-08
003-SB-30D-10

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF16 consists of seven (10) solid environmental samples, one (1) aqueous environmental sample, and three (3) field quality control blanks. All of the samples were analyzed for Target Compound List (TCL) volatile organic compounds. Sample 003-SW-00301 was also analyzed for TCL semivolatile organic compounds and polychlorinated biphenyls (PCBs). The field crew designated samples for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses. The laboratory also analyzed blank spike samples.

The samples were collected by Brown and Root Environmental on October 23rd, 24th and 27th, 1997 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Method 8260 for aqueous samples and CLP OLM03.1 analytical and reporting protocols for soil samples. The data contained in this SDG were validated with regard to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- Matrix Spike/Matrix Spike Duplicate Results
- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

Initial calibration and/or continuing calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Positive and nondetected results were affected by these noncompliances. Positive and nondetected results reported in the affected samples were

qualified as estimated, (J) and rejected, (UR).

Continuing calibration Percent Differences (%Ds) greater than 25% were reported for 2-hexanone, bromoform, and chloroethane. Nondetected results were affected by these noncompliances. Nondetected results were qualified as estimated, (UJ), in the affected samples.

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride	4 µg/kg	40 µg/kg
Methylene Chloride*	2.6 µg/L	26 µg/L
Toluene*	1 µg/L	10 µg/L
Chloroform*	26 µg/L	130 µg/L
Acetone*	3.4 µg/L	34 µg/L, 34 µg/kg

Samples affected: All

* - Contaminant detected in a trip blank.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors, percent solids, and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for methylene chloride, acetone, chloroform, and toluene were qualified in the manner indicated by the blank action table. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The quantitation report for sample 003-SB-30D-01 was missing from the SDG. The report was requested from the laboratory and was received.

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for 2-fluorobiphenyl, phenol-d5, and 2-chlorophenol. No action was taken on the basis of surrogate percent difference noncompliance.

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Di-n-butyl phthalate	1 µg/L	10 µg/L
Bis(2-ethylhexyl)phthalate	2 µg/L	20 µg/L

Samples affected: All.

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value and qualify as estimated, (J).

Dilution factors and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate were qualified in the manner indicated by the blank action table. No action was taken regarding di-n-butyl phthalate as the compound was not detected in the samples.

The surrogate 2,4,6-tribromophenol was slightly higher than the quality control limits in 003-SW-00301 and 003-SW-00301MSD. No action was taken on this basis.

The compound 4-nitrophenol was slightly higher than the quality control limits in 003-SW-00301MS/MSD. No action was taken on this basis. The nondetected result for this compound was qualified as estimated, (UJ).

Polychlorinated Biphenyls

All parameters were met for this fraction.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs and %Ds outside than their respective quality control limits were reported for several volatile and semivolatile compounds. Bis(2-ethylhexyl)phthalate, methylene chloride, toluene, chloroform, and acetone were detected in the laboratory method blanks and/or field quality control blanks.

Other Factors Affecting Data Quality: The volatile quantitation report for sample 003-SB-30D-01 was missing from the SDG.


The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF16

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA	SVOA	PCB
003-TB-04801	R ¹	J ^{1,2,3}	
003-TB-04901	R ¹	J ^{1,2,3}	
003-BB-00901	R ^{1,2}	J ^{1,2}	
003-SW-00301	R ^{1,2}	J ^{1,2}	A ⁶ J ⁵
003-SB-30D-01	A ^{1,3}	J ⁴	
003-SB-30D-02	A ^{1,3,4}	J ^{1,4}	
003-SB-30D-03	A ^{1,3}	J ^{1,4}	
003-SB-30D-04	A ^{2,3}	J ^{1,4}	
003-SB-30D-05	A ^{2,3}	J ^{1,4}	
003-SB-30D-06	A ^{2,3}	J ^{1,4}	
003-SB-30D-07	A ^{2,3}	J ^{1,4}	
003-SB-30D-08	A ^{2,3}	J ^{1,4}	
003-SB-30D-09	A ^{2,3}	J ^{1,4}	
003-SB-30D-10	A ^{2,3}	J ⁴	

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of an exceedance of the blank action level.
- A² - Accept data, but replace positive results for acetone with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method and/or field blank contamination.
- A³ - Accept data, but replace positive results for methylene chloride with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method and/or field blank contamination.
- A⁴ - Accept data, but replace positive results for toluene with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method and/or field blank contamination.
- A⁵ - Accept data, but replace positive results for chloroform with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method and/or field blank contamination.
- A⁶ - Accept data, but replace positive results for bis(2-ethylhexyl) phthalate with a revised detection limit and qualify as nondetected, (U), as a result of laboratory method and/or field blank contamination.
- R¹ - Reject data, qualify nondetected results for 2-butanone and 2-hexanone as rejected, (UR), due to initial and/or continuing calibration RRFs less than 0.05.
- R² - Reject data, qualify nondetected results for acetone as rejected, (UR), due to initial and/or continuing calibration RRFs less than the 0.05 quality control limit.
- J¹ - Accept data, but qualify positive results below the CRQL as estimated, (J).
- J² - Accept data, but qualify nondetected results for bromoform as estimated, (UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.
- J³ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of initial and/or continuing calibration RRFs less than the 0.05 quality control limit.
- J⁴ - Accept data, but qualify nondetected results for chloroethane and 2-hexanone as estimated,

(UJ), as a result of continuing calibration %Ds greater than the 25% quality control limit.

J⁵

Accept data, but qualify nondetected result for 4-nitrophenol as estimated,(UJ), due to MS/MDS noncompliance.

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	undecane dodecane
Semivolatile	Unknown(s)



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-12-7-189

TO: MARK SLADIC

DATE: APRIL 1, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF17

SAMPLES: Soils\VOA:

003-SB-31D-01	003-SB-31D-02	003-SB-31D-03	003-SB-31D-04
003-SB-31D-05	003-SB-31D-06	003-SB-31D-07	003-SB-31D-08
003-SB-31D-09	003-SB-31D-10	003-SB-31D-11	003-SB-31D-12
003-SB-31D-13	003-SB-DP2-01	003-SB-DP2-02	

Waters\VOA:

003-TB-050-01	003-TB-051-01
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The sample set for the CTO 003 NIROP Fridley, SDG BRF17, consists of fifteen soil and two trip blanks (designated TB). All samples were analyzed for Target Compound List (TCL) volatile organic compounds.

The samples were collected by Brown & Root Environmental on November 12, 13, and 14, 1997, and analyzed by Laucks Testing Laboratories. The volatile compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All soil sample analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. Aqueous sample analyses were conducted using SW-846 Method 8260A. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- • Initial and continuing calibrations
- • Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Detection limits
- * • Sample identification
- • Sample quantitation
- * • Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: MARK SLADIC
 DATE: DECEMBER 23, 1997 - PAGE 2

Volatiles

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Acetone	4.0 µg/kg	—	40 µg/kg
Methylene chloride	5.0 µg/kg	—	50 µg/kg
Methylene chloride	0.2 µg/L	2 µg/L	6 µg/kg

Samples Affected: All.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). Positive results for the compound reported at concentrations above the detection limit were qualified as nondetects, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. No actions were warranted as a result of these noncompliances since the problems in the calibration only affected the quality control samples.

The continuing calibration RRFs for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Nondetected results were considered to be unusable and were rejected (UR).

The continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for carbon tetrachloride and 2-hexanone. Nondetected results for carbon tetrachloride in associated samples were qualified as estimated, (UJ). No action was warranted for 2-hexanone due to the more severe noncompliance of the RRF value.

All soil samples were diluted 10-fold.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Continuing calibration %Ds for carbon tetrachloride and 2-hexanone exceeded the 25% quality control limit. Methylene chloride and acetone were detected in laboratory method blanks.


Other Factors Affecting Data Quality: Methylene chloride was detected in the field quality control blanks.

MEMO TO: MARK SLADIC
DATE: DECEMBER 23, 1997 - PAGE 3

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Dana L. Peto

Brown & Root Environmental
Data Validator


Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF17**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatiles		
003-TB-050-01		J ¹	R ¹
003-SB-31D-01	A ^{1,2}	J ²	
003-SB-31D-02	A ^{1,2}	J ²	
003-SB-31D-03	A ^{1,2}	J ²	
003-SB-31D-04	A ^{1,2}	J ²	
003-SB-31D-05	A ^{1,2}	J ²	
003-SB-31D-06	A ^{1,2}	J ²	
003-SB-31D-07	A ^{1,2}	J ²	
003-SB-31D-08	A ^{1,2}	J ²	
003-SB-31D-09	A ^{1,2}		
003-SB-31D-10	A ^{1,2}		
003-SB-31D-11	A ^{1,2}	J ²	
003-SB-DP2-01	A ^{1,2}	J ²	
003-SB-DP2-02	A ^{1,2}	J ²	
003-TB-051-01		J ¹	R ¹
003-SB-31D-12	A ^{1,2}	J ²	
003-SB-31D-13	A ^{1,2}	J ²	

-
- A¹ - Accept data, but change positive results for acetone to revised detection limits and qualify as nondetected, (U), as a result of laboratory method blank contamination.
- A² - Accept data, but change positive results for methylene chloride to revised detection limits and qualify as nondetected, (U), as a result of laboratory method blank contamination or field quality control blank.
- J¹ - Accept data, but qualify nondetects for carbon tetrachloride as estimated (UJ), as a result of continuing calibration %D greater than 25%.
- J² - Accept data, but qualify positive results < CRQL as estimated, (J).
- R¹ - Reject nondetects for acetone, 2-butanone, and 2-hexanone as a result of initial and/or continuing calibration RRFs less than 0.05.



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-01-7-016

TO: MARK SLADIC

DATE: MARCH 25, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF18

SAMPLES: Soils\VOA:

003-SB-33D-01	003-SB-33D-02	003-SB-33D-03	003-SB-33D-04
003-SB-33D-05	003-SB-33D-06	003-SB-33D-07	003-SB-33D-08
003-SB-33D-09	003-SB-33D-10	003-SB-33D-11	003-SB-33D-12
003-SB-DP2-03			

Waters\VOA:

003-TB-052-01	003-TB-053-01	003-BB-010-01
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The sample set for the CTO 003 NIROP Fridley, SDG BRF18, consists of thirteen soil, two trip blanks (designated TB), and a batch blank (designated BB). All samples were analyzed for Target Compound List (TCL) volatile organic compounds.

The samples were collected by Brown & Root Environmental on November 18, 19, and 20, 1997, and analyzed by Laucks Testing Laboratories. The volatile compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All soil sample analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. Aqueous sample analyses were conducted using SW-846 Method 8260A. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Detection limits
- * • Sample identification
- * • Sample quantitation
- * • Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: MARK SLADIC
 DATE: JANUARY 6, 1997 - PAGE 2

Volatiles

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Acetone	11.0 µg/kg	—	110 µg/kg
Methylene chloride	2.0 µg/kg	—	20 µg/kg
Methylene chloride*	0.4 µg/L	4.0 µg/L	—
Chloroform*	20.0 µg/L	—	200 µg/kg
Bromodichloromethane	0.2 µg/L	—	2.0 µg/kg

Samples Affected: All.

*Maximum detection found in field quality control blanks.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Nondetected results were considered to be unusable and were rejected, (UR).

The continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for carbon tetrachloride, 2-hexanone, trans-1,3-dichloropropene, and bromoform. Nondetected results in associated samples were qualified as estimated, (UJ). No action was warranted for 2-hexanone due to the more severe noncompliance of the RRF value.

In sample 003-SB-33D-08, the compound trichloroethene exceeded (E) the instrument's linear calibration range. The sample was diluted and only the trichloroethene results were transposed over to the original sample results and used in the validation of the SDG.

All soil samples were diluted 10-fold.

The matrix spike/matrix spike duplicate (MS/MSD) percent recovery (%R) for trichloroethene was below the quality control limits for MS %R, MSD %R, and relative percent differences. No action was taken because all other quality control limits were not exceeded.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Continuing calibration %Ds for carbon tetrachloride, 2-hexanone, trans-1,3-dichloropropene, and bromoform exceeded the 25% quality control limit.

MEMO TO: MARK SLADIC
DATE: JANUARY 6, 1997 - PAGE 3


Methylene chloride and acetone were detected in laboratory method blanks.

Other Factors Affecting Data Quality: Methylene chloride was detected in the field quality control blanks. Chloroform and bromodichloromethane were detected in the batch blank.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Dana L. Pieto

Brown & Root Environmental
Data Validator


Joseph A. Samchuck
Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF18**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatiles		
003-TB-052-01	A ²	J ¹	R ¹
003-SB-33D-01	A ^{1,2}	J ³	
003-SB-33D-02	A ^{1,2}		
003-SB-33D-03	A ^{1,2}		
003-SB-33D-04	A ^{1,2}		
003-SB-33D-05	A ^{1,2}		
003-TB-053-01		J ²	R ¹
003-SB-33D-06	A ^{1,2}		
003-SB-33D-07	A ^{1,2}		
003-SB-33D-08	A ^{1,2}		
003-SB-33D-09	A ^{1,2}		
003-SB-33D-10	A ^{1,2}		
003-SB-33D-11	A ^{1,2}		
003-SB-33D-12	A ^{1,2}		
003-SB-DP2-03	A ^{1,2}		
003-BB-010-01		J ^{2,3}	R ¹

A ¹	-	Accept data, but change positive results for acetone to revised detection limits and qualify as nondetected, (U), as a result of laboratory method blank contamination.
A ²	-	Accept data, but change positive results for methylene chloride to revised detection limits and qualify as nondetected, (U), as a result of laboratory method blank contamination or field quality control blank.
J ¹	-	Accept data, but qualify nondetects for carbon tetrachloride as estimated (UJ), as a result of continuing calibration %D greater than 25%.
J ²	-	Accept data, but qualify nondetects for carbon tetrachloride, trans-1,3-dichloropropene, and bromoform as estimated (UJ), as a result of continuing calibration %D greater than 25%.
J ³	-	Accept data, but qualify positive result < CRQL as estimated, (J).
R ¹	-	Reject nondetects for acetone, 2-butanone, and 2-hexanone as a result of initial and continuing calibration RRFs less than 0.05.

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

Fraction

Volatile

Named TIC

Unknown substituted Benzene(s)

Undecane

Dodecane



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-01-8-156

TO: MARK SLADIC

DATE: MARCH 25, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF19

SAMPLES: Soils\VOA:

003-SB-28D-01	003-SB-28D-03	003-SB-28D-04	003-SB-28D-05
003-SB-28D-06	003-SB-28D-07	003-SB-28D-08	003-SB-28D-09
003-SB-28D-10	003-SB-28D-11	003-SB-DP2-04	003-SB-29D-01
003-SB-29D-02	003-SB-29D-03	003-SB-29D-04	003-SB-29D-05
003-SB-29D-06	003-SB-DP2-05		

Waters\VOA:

003-TB-054-01	003-TB-055-01	003-TB-056-01
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The sample set for the CTO 003 NIROP Fridley, SDG BRF19, consists of eighteen soil environmental samples and three trip blanks (designated TB). All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds. Two field duplicate pairs (003-SB-28D-10/003-SB-DP2-04 and 003-SB-29D-06/003-SB-DP2-05) were included in this SDG.

The samples were collected by Brown & Root Environmental on December 2, 3, 5 and 6, 1997, and analyzed by Laucks Testing Laboratories. The volatile compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All soil analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. All aqueous analyses were conducted using SW846 Method 8260B. The data were evaluated according to the following parameters:

- * . Data completeness
- * . Holding times
- * . GC/MS tuning and mass calibration
- * . Initial and continuing calibrations
- * . Laboratory and field blank analyses
- * . Surrogate spike recoveries
- * . Laboratory control sample results
- * . Internal standard performance
- * . Detection limits
- * . Field Duplicate Precision
- * . Sample identification
- * . Sample quantitation
- * . Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: MARK SLADIC
 DATE: JANUARY 23, 1998 - PAGE 2

Volatiles

All positive results reported at concentrations less than the Contract required Quantitation Limit (CRQL) were qualified as estimated, (J).

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
2-Hexanone	1 µg/kg	—	10 µg/kg
Methylene chloride	8 µg/kg	—	80 µg/kg
Methylene chloride*	0.7 µg/L	—	7 µg/kg
Acetone*	1.9 µg/L	—	19 µg/kg

*Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: All.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (U). Positive results for the compound reported at concentrations above the detection limit were qualified as nondetected, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Positive results reported for these compounds in the affected samples were qualified as estimated (J), and nondetected results were considered to be unusable and were rejected (UR).

The continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for vinyl chloride, 1,1-dichloroethene, 2-hexanone, acetone, carbon disulfide, 2-butanone, 1,1,1-trichloroethane, and carbon tetrachloride. Positive results reported for these compounds in the affected samples were qualified as estimated (J), and nondetected results were qualified as estimated, (UJ).

The matrix spike/matrix spike duplicate (MS/MSD) analyses displayed low Percent Recoveries (%Rs) for trichloroethene, benzene, toluene, and chlorobenzene. Positive results reported for these compounds in the affected sample were qualified as estimated (J), and nondetected results were qualified as estimated, (UJ).

All soil samples were diluted 10-fold.

No other problems were noted.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Continuing calibration %Ds for vinyl chloride, 1,1-dichloroethene, 2-hexanone, acetone, carbon disulfide, 2-butanone, 1,1,1-trichloroethane, and carbon tetrachloride exceeded the 25% quality control limit. Methylene chloride and 2-hexanone were detected in laboratory method blanks.


MEMO TO: MARK SLADIC
DATE: JANUARY 23, 1998 - PAGE 3

Other Factors Affecting Data Quality: Methylene chloride and acetone were detected in the field quality control blanks.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

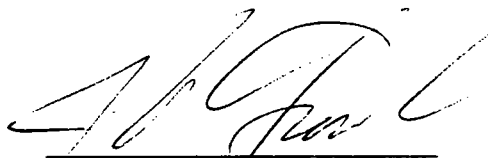
The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Dana L. Pieto

Brown & Root Environmental
Data Validator



Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF19**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile		
003-TB-054-01		J ^{2,7}	R ¹
003-SB-28D-01	A ^{1,2}	J ^{1,7}	
003-SB-28D-03	A ¹	J ^{1,7}	
003-SB-28D-04	A ^{1,2}	J ^{1,7}	
003-SB-28D-05	A ^{1,2,3}	J ^{1,7}	
003-TB-055-01		J ^{2,7}	R ¹
003-SB-28D-06	A ^{1,4}	J ^{1,7}	
003-SB-28D-07	A ^{1,2}	J ^{1,7}	
003-SB-28D-08	A ^{1,2}	J ^{1,7}	
003-SB-28D-09	A ^{1,2}	J ^{1,7}	
003-SB-28D-10	A ^{1,2}	J ^{1,7}	
003-SB-28D-11	A ^{1,2}	J ^{1,7}	
003-SB-DP2-04	A ^{1,4}	J ^{1,7}	
003-TB-056-01		J ⁷	R ²
003-SB-29D-01	A ^{1,2}	J ^{3,4,7}	
003-SB-29D-02	A ^{1,2}	J ^{3,4,7}	
003-SB-29D-03	A ^{1,2}	J ^{3,4,7}	
003-SB-29D-04	A ^{1,2}	J ^{3,4,7}	
003-SB-29D-05	A ^{1,2}	J ^{3,4,7}	
003-SB-29D-06	A ^{1,2}	J ^{3,4,5,6,7}	
003-SB-DP2-05	A ^{1,2}	J ^{3,4,7}	

- A¹ - Accept data, but change positive results for methylene chloride to revised detection limits and qualify as nondetected, (U), as a result of laboratory method blank contamination and field quality control blank contamination.
- A² - Accept data, but qualify positive results estimated (J) for acetone as a result of exceedance of the blank action level.
- A³ - Accept data, but qualify positive results estimated (U) for 2-hexanone as a result of laboratory method blank contamination.
- A⁴ - Accept data, but qualify positive results estimated (U) for acetone as a result of field quality control blank contamination.
- J¹ - Accept data, but qualify nondetected results as estimated (UJ) for vinyl chloride and 1,1-dichloroethene as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, but qualify positive results estimated (J) for acetone as a result of continuing calibration RRFs less than 0.05.
- J³ - Accept data, but qualify positive results as estimated (J) for 2-butanone as a result of continuing calibration %D greater than 25%.
- J⁴ - Accept data, but qualify nondetected results as estimated (UJ) for carbon disulfide, 1,1,1-trichloroethane, and carbon tetrachloride as a result of continuing calibration %Ds greater than 25%.
- J⁵ - Accept data, but qualify positive results estimated (J) for trichloroethene and toluene as a result of MS/MSD %Rs below the quality control limits.

- J⁶ - Accept data, but qualify nondetected results estimated (UJ) for benzene and chlorobenzene as a result of MS/MSD %Rs below the quality control limits.
- J⁷ - Accept data, but qualify positive results < CRQL as estimated, (J).
- R¹ - Reject nondetected results for 2-butanone and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.
- R² - Reject nondetected results for acetone, 2-butanone, and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-01-8-138

TO: MARK SLADIC

DATE: MARCH 25, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF20

SAMPLES: Soils\VOA:

003-SB-29D-07	003-SB-29D-08	003-SB-29D-09	003-SB-29D-10
003-SB-29D-11	003-SB-29D-12	003-SB-29D-13	003-SB-29D-14
003-SB-32D-01	003-SB-32D-02	003-SB-32D-03	003-SB-32D-04
003-SB-32D-05	003-SB-32D-06	003-SB-32D-07	003-SB-32D-08
003-SB-32D-09			

Waters\VOA:

003-AB-007-01	003-TB-057-01	003-SB-32D-01
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The sample set for the CTO 003 NIROP Fridley, SDG BRF20, consists of seventeen soil and one aqueous environmental samples, one ambient blank (designated AB), and one trip blank (designated TB). All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds.

The samples were collected by Brown & Root Environmental on December 6 and 8, 1997, and analyzed by Laucks Testing Laboratories. The volatile compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All soil analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. All aqueous analyses were conducted using SW846 Method 8260B. The data were evaluated according to the following parameters:

- * . Data completeness
- * . Holding times
- * . GC/MS tuning and mass calibration
- . . Initial and continuing calibrations
- . . Laboratory and field blank analyses
- * . Surrogate spike recoveries
- * . Laboratory control sample results
- * . Internal standard performance
- * . Detection limits
- * . Sample identification
- . . Sample quantitation
- * . Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatiles

All positive results reported at concentrations less than the Contract required Quantitation Limit (CRQL) were qualified as estimated, (J).

**NIROP FRIDLEY
SDG NO. BRF20**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile	
003-SB-29D-07	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-08	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-09	A ^{1,2}	J ^{2,3,4,8}
003-AB-007-01		J ¹ R ¹
003-SB-29D-10	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-11	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-12	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-13	A ^{1,2}	J ^{2,3,4,8}
003-SB-29D-14	A ^{1,2}	J ^{2,3,4,8}
003-SW-004-01		J ⁸ R ²
003-TB-057-01		J ⁸ R ²
003-SB-32D-01	A ^{1,2}	J ^{5,8}
003-SB-32D-02	A ^{1,2}	J ⁵
003-SB-32D-03	A ^{1,2}	J ^{5,8}
003-SB-32D-04	A ^{1,2}	J ^{5,8}
003-SB-32D-05	A ^{1,2}	J ^{5,6,7,8}
003-SB-32D-06	A ^{1,2}	J ^{5,8}
003-SB-32D-07	A ^{1,2}	J ^{5,8}
003-SB-32D-08	A ^{1,2}	J ^{5,8}
003-SB-32D-09	A ^{1,2}	J ^{5,8}

- A¹ - Accept data, but change positive results for methylene chloride to revised detection limits and qualify as nondetected, (BU), as a result of laboratory method blank contamination and field quality control blank contamination.
- A² - Accept data, but qualify positive results estimated, (BJ), for acetone as a result of field quality control blank contamination.
- J¹ - Accept data, but qualify positive results estimated, (J), for acetone as a result of continuing calibration RRFs less than 0.05.
- J² - Accept data, but qualify positive results estimated, (J), and nondetected results estimated, (UJ), for carbon disulfide as a result of continuing calibration %D greater than 25%.
- J³ - Accept data, but qualify positive results estimated, (J), and nondetected results as estimated, (UJ), for 2-butanone as a result of continuing calibration %D greater than 25%.
- J⁴ - Accept data, but qualify nondetected results as estimated (UJ) for 1,1,1-trichloroethane and carbon tetrachloride as a result of continuing calibration %Ds greater than 25%.
- J⁵ - Accept data, but qualify nondetected results as estimated (UJ) for bromomethane and chloroethane as a result of continuing calibration %Ds greater than 25%.
- J⁶ - Accept data, but qualify positive results estimated (J) for trichloroethene as a result of MS/MSD %Rs below the quality control limits.
- J⁷ - Accept data, but qualify nondetected results estimated (UJ) for benzene, toluene, and chlorobenzene as a result of MS/MSD %Rs below the quality control limits.
- J⁸ - Accept data, but qualify positive results < CRQL as estimated, (J).

- R¹ - Reject nondetected results for 2-butanone and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.
- R² - Reject nondetected results for acetone, 2-butanone, and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.

MEMO TO: MARK SLADIC
 DATE: JANUARY 22, 1998 - PAGE 2

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Methylene chloride	8 µg/kg	—	80 µg/kg
Acetone*	2.8 µg/L	—	28 µg/kg

*Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: All.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). Positive results for the compound reported at concentrations above the detection limit were qualified as nondetected, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Positive results reported for these compounds in the affected samples were qualified as estimated (J), and nondetected results were considered to be unusable and were rejected (UR).

The continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for 2-hexanone, acetone, carbon disulfide, 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, bromomethane, and chloroethane. Positive results reported for these compounds in the affected samples were qualified as estimated (J), and nondetected results were qualified as estimated, (UJ).

The matrix spike/matrix spike duplicate (MS/MSD) analyses displayed low Percent Recoveries (%Rs) for trichloroethene, benzene, toluene, and chlorobenzene. Positive results reported for these compounds in the affected sample were qualified as estimated (J), and nondetected results were qualified as estimated, (UJ).

All soil samples were diluted 10-fold.

No other problems were noted.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Continuing calibration %Ds for 2-hexanone, acetone, carbon disulfide, 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, bromomethane, and chloroethane exceeded the 25% quality control limit. Methylene chloride was detected in laboratory method blanks.

Other Factors Affecting Data Quality: Methylene chloride and acetone were detected in the field quality control blanks.

MEMO TO: MARK SLADIC
DATE: JANUARY 22, 1998 - PAGE 3

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Brown & Root Environmental

Dana L. Pioto
Data Validator


Brown & Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-04-8-094

TO: MARK SLADIC

DATE: MAY 13, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs, SVOCs, & PCBs
CTO 003, FRIDLEY, MINNESOTA
SDG BRF24

SAMPLES: Waters\VOC:

003-MS-30D-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
003-TB-066-01	003-TB-067-01		

Waters\SVOC\PCB:

003-MS-30D-01	003-MS-32D-01	003-MS-32I-01	003-MS-DP2-02
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The sample set for the CTO 003, Fridley, SDG BRF24, consists of four aqueous environmental samples and two trip blanks (designated TB). The environmental samples were analyzed for Target Compound List (TCL) volatile, semivolatile, and PCB organic compounds. The trip blanks were analyzed for TCL volatile organic compounds only. One field duplicate pair (003-MS-32I-01 and 003-MS-DP2-02) was included in this SDG.

The samples were collected by Brown & Root Environmental on March 2 and 3, 1998, and analyzed by Laucks Testing Laboratories. The volatile, semivolatile, and PCB compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All volatile analyses were conducted using the SW-846 Method 8260B. All semivolatile and PCB analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLC02.1) analytical and reporting protocols. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Detection limits
- * • Sample identification
- * • Sample quantitation

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 - PAGE 2

* • Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatiles

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound:</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>
Acetone*	4.9 µg/L	49 µg/L
Methylene chloride*	0.9 µg/L	9 µg/L

*Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: None

Sample aliquot and dilution factors were taken into consideration during the application of the action level. No action was warranted for acetone and methylene chloride since no positive results were reported for these compounds in the affected samples. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial relative response factors (RRFs) were below 0.050 for acetone and 2-butanone. The continuing calibration RRFs were below 0.050 for acetone, 2-butanone, and 2-hexanone. Positive results were qualified as estimated, (J), and nondetected results were qualified as rejected, (UR).

The continuing calibration percent differences (%Ds) for 1,1,1-trichloroethane, trans-1,3-dichloropropene and bromomethane exceeded the 20% quality control criterion. Nondetected results were qualified as estimated, (UJ).

Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trichloroethene exceeded the instrument's linear calibration range in samples 003-MS-32I-01 and 003-MS-DP2-02. These samples were diluted 500-fold and reanalyzed. The dilution results for only these compounds were transposed over to the original sample results and used in validation of this SDG.

The field duplicate pair (003-MS-32I-01 and 003-MS-DP2-02) results for 1,1-dichloroethane were significantly different. No qualification of the sample results is made based on field duplicate recoveries.

It should be noted that the significant figures for the electronic data and the Form Is did not agree. The data reviewer has amended the electronic data to concur with the Form Is.

Semivolatiles

The following volatile compounds were detected in the laboratory method blank at the maximum

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 - PAGE 3

concentrations indicated below:

<u>Compound:</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>
bis(2-ethylhexyl)phthalate	1.0 µg/L	10 µg/L

Samples Affected: All

Sample aliquot and dilution factors were taken into consideration during the application of the action level. Positive results for the aforementioned compound reported at concentrations below the action level were qualified as nondetects, (U).

The surrogate percent recovery (%R) for 2-fluorobiphenyl was below the lower quality control limit in sample 003-MS-32D-01. No action was warranted since only one fractional surrogate was noncompliant.

Pesticides/PCBs

No problems were noted.

Executive Summary

Laboratory Performance: The volatile initial and/or continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. The continuing calibration %Ds greater than the quality control limit were reported for trans-1,3-dichloropropene and bromomethane. Methylene chloride was detected in the volatile laboratory method blanks.

Other Factors Affecting Data Quality: Acetone and methylene chloride were detected in the volatile field quality control blanks. Bis(2-ethylhexyl)phthalate was detected in the semivolatile field quality control blanks.

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 - PAGE 4

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

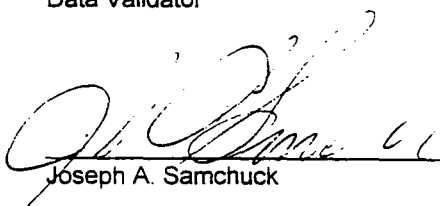
The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Dana L. Pioto

Brown & Root Environmental
Data Validator



Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF24**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile		Semivolatile	PCB
003-MS-30D-01	J ⁴	R ¹		
003-MS-32D-01	J ³	R ¹	A ¹	
003-MS-32I-01	J ^{2,3}	R ¹	A ¹	
003-MS- DP2-02	J ^{2,3}	R ¹	A ¹	
003-TB-066-01	J ^{1,2,4}	R ²		
003-TB-067-01	J ^{1,2,4}	R ²		

If field is left blank, the qualifier is A - accept all data.

- A¹ - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory method blank contamination.
- J¹ - Accept data, but qualify positive results for acetone as estimated, (J), as a result of continuing calibration RRFs less than 0.05.
- J² - Accept data, but qualify positive results less than the CRQL as estimated, (J).
- J³ - Accept data, but qualify nondetected results for 1,1,1-trichloroethene and trans-1,3-dichloropropene as estimated, (UJ), as a result of continuing calibration %Ds greater than 20%.
- J⁴ - Accept data, but qualify nondetected results for 1,1,1-trichloroethene, trans-1,3-dichloropropene, and bromomethane as estimated, (UJ), as a result of continuing calibration %Ds greater than 20%.
- R¹ - Reject nondetected results for acetone, 2-butanone, and 2-hexanone as a result of continuing calibration RRFs less than 0.05.
- R² - Reject nondetected results for 2-butanone and 2-hexanone as a result of continuing calibration RRFs less than 0.05.

Data Qualifier Key:

- | | | |
|----|---|---|
| U | - | Value is a nondetect as reported by the laboratory and should not be considered present or result has been qualified as a false positive. |
| J | - | Positive result is estimated as result of a value below the CRQL or as a result of initial and continuing calibration RRFs <0.05. |
| UR | - | Rejected as a result of initial and continuing calibration RRFs <0.05. |

**Summary of Tentatively Identified Compounds (TICs)
Remaining After Data Qualification**

Fraction

Semivolatile

Named TIC

Unknown(s)
Sulfur, mol. (S8)



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-064

TO: MARK SLADIC
FROM: SEAN NIXON
SUBJECT: INORGANIC DATA VALIDATION - ALAKLINITY, BROMIDE, CHLORIDE, HARDNESS, NITRATE, NITRITE, ORTHOPHOSPHATE, SULFATE, AND TOTAL SUSPENDED SOLIDS
CTO 003 - NIROP FRIDLEY
SDG - BRF24

DATE: APRIL 10, 1998

COPIES: DV FILE

SAMPLES: 4/Aqueous

003-MS-30D-01 003-MS-32D-01 003-MS-32I-01 003-MS-DUP2-02

4/Filtrate

003-MS-30D-F1 003-MS-32D-F1 003-MS-32I-F1 003-MS-DUP2-F2

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF24 consists of four (4) aqueous environmental samples and four (4) corresponding filtrates. One (1) field duplicate pair, samples 003-MS-32I-01/003-MS-DP2-01 and 003-MS-32I-F1/003-MS-DP2-F1, was included within this SDG. Samples 003-MS-30D-01 and 003-MS-30D-F1 were specified for Matrix Spike/Matrix Spike Duplicate analysis by the field crew.

The unfiltered samples were analyzed for alkalinity, hardness, nitrate, nitrite, sulfate and total suspended solids. The filtered samples were analyzed for bromide, chloride, and orthophosphate. The samples were collected by Brown and Root Environmental on March 2 and 3, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The samples were analyzed for alkalinity according to EPA Method 310.0, for bromide, chloride, nitrate, nitrite, orthophosphate, and sulfate according to EPA Method 300.0, for hardness according to EPA Method 130.2, and for total suspended solids according to SM2540.

- * • Data Completeness
- Holding Times
- * • Calibration Issues
- * • Laboratory Blank Analyses
- * • Matrix Spike Results (MS)
- * • Duplicate Results
- * • Field Duplicate Results
- * • Laboratory Control Sample Results
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: APRIL 10, 1998 PAGE 2

C-49-04-8-064

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Notes

The laboratory stated that sample 003-MS-32I-01 was analyzed 4 hours outside of the 48 hour holding time for nitrate, nitrite, and orthophosphate. No action was taken for this minor holding time exceedance.

Sample 003-MS-30D-01 was analyzed one day outside of the seven day holding time for Total Suspended Solids. No action was taken for this minor holding time exceedance.

A field duplicate comparison is presented in Appendix C.

Executive Summary

Laboratory Performance: No issues.

Other Factors Affecting Data Quality: No other issues affected data quality.


MEMO TO: MARK SLADIC
DATE: APRIL 10, 1998 PAGE 3

C-49-04-8-064

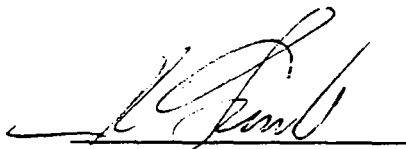
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental



Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF24**

TABLE 1 - RECOMMENDATION SUMMARY

Alkalinity
Bromide
Chloride
Hardness
Nitrate
Nitrite
Orthophosphate
Sulfate
Total suspended solids

If the field is left blank, the qualifier is A - Accept all data.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-057

TO: MARK SLADIC

DATE: APRIL 14, 1998

FROM: SEAN NIXON

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF24

SAMPLES: 4/Aqueous

003-MS-30D-01

003-MS-32D-01

003-MS-32I-01

003-MS-DUP2-02

4/Filtrate

003-MS-30D-F1

003-MS-32D-F1

003-MS-32I-F1

003-MS-DUP2-F2

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF24 consists of four (4) aqueous environmental samples and four (4) corresponding filtrates. The field crew specified samples 003-MS-30D-01 and 003-MS-30D-F1 for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis

All samples were analyzed for Target Analyte List (TAL) metals and cyanide except the filtrates which were not analyzed for cyanide. The samples were collected by Brown and Root Environmental on March 2 and 3, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The aqueous and filtrate samples were prepared and analyzed according Contract Laboratory Procedure (CLP) ILM04.0. The laboratory analyzed all analytes via ICP methodology with the exception of arsenic, lead, mercury, selenium, thallium, and cyanide. Arsenic, lead, selenium, and thallium were analyzed via GFAA, while mercury was analyzed via CVAA. Cyanide was analyzed via wet chemistry methods. These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration Issues
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- Matrix Spike Results (MS)
- * • ICP Serial Dilution Results
- * • Duplicate Results
- Post-digestion Spikes
- * • Field Duplicate Results
- * • Laboratory Control Sample Results
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: APRIL 14, 1998 PAGE 2

C-49-04-8-057

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

<u>Element</u>	<u>Maximum Concentration (ug/L)</u>	<u>Aqueous Action Level (ug/L)</u>
Barium	1.3	6.5
Cobalt	4.1	20.5
Iron ¹	18.9	94.5
Zinc ¹	4.0	20.0

Samples affected: All

¹ Maximum concentration found in preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the associated action levels for the aforementioned elements were qualified as estimated, (J). Positive results less than the associated action levels for barium and zinc have been qualified as nondetected (U).

Matrix Spike/Matrix Spike Duplicate

The MS/MSD analyses of sample 003-MS-30D-01 yielded a Percent Recovery below the 75% quality control limit for selenium and thallium. The nondetected results for selenium and thallium in the samples of the unfiltered matrix were qualified as estimated, (UJ).

The MS/MSD analyses of sample 003-MS-30D-F1 yielded a Percent Recovery below the 75% quality control limit for selenium and thallium. The positive and nondetected results for selenium and thallium in the samples of the filtered matrix were qualified as estimated, (J) and (UJ), respectively.

Post-Digestion Spikes

The post-digestion spikes for selenium yielded low Percent Recoveries (%Rs) in samples 003-MS-32D-01, 003-MD-32D-F1, 003-MS-30D-01, 003-MS-30D-F1, 003-MS-32I-F1. The positive and nondetected results for selenium in the aforementioned samples were qualified as estimated, (J) and (UJ) respectively.

The post-digestion spikes for thallium yielded low %Rs in samples 003-MS-DP-02, 003-MS-DP-F2, 003-MS-30D-01, and 003-MS-30D-F1. The nondetected results for thallium in the aforementioned samples were qualified as estimated, (UJ).

MEMO TO: MARK SLADIC
DATE: APRIL 14, 1998 PAGE 3

C-49-04-8-057

Notes

The Contract Required Detection Limits (CRDL) analyses yielded %Rs above the 120% quality control limit for thallium. However, no validation actions were taken for CRDL noncompliance.

It should be noted that the Form is truncated some results by omitting the decimal value. The data reviewer has amended the appropriate forms.

It should be noted that all of the corresponding filtrates of each sample yielded slightly higher results for several elements. The laboratory stated that this minor difference is likely a result of aliquoting differences between the samples. No validation action was taken, but this issue is noted for completeness.

Executive Summary

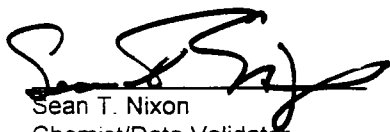
Laboratory Performance: Blank contamination was noted for several elements.

Other Factors Affecting Data Quality: Low Matrix Spike recoveries were noted for selenium and thallium. Low post-digestion spike recoveries were noted for selenium and thallium.

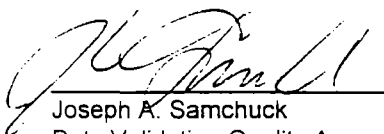
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental



Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF24**

TABLE 1 - RECOMMENDATION SUMMARY TAL METALS AND CYANIDE

Aluminum		Magnesium	
Antimony		Manganese	
Arsenic		Mercury	
Barium	J ¹	Nickel	
Beryllium		Potassium	
Cadmium		Selenium	J ^{2, 3, 4}
Calcium	J ¹	Silver	
Chromium		Sodium	
Cobalt	A ¹	Thallium	J ^{2, 3, 4}
Copper		Vanadium	
Cyanide		Zinc	A ¹
Iron	J ¹		
Lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results in exceedance of the blank action level as estimated, (J).
- J² - Accept data, but qualify nondetected results of the unfiltered matrix as estimated, (UJ), as a result of low MS/MSD %R.
- J³ - Accept data, but qualify positive and nondetected results of the filtered matrix as estimated, (J) and (UJ) respectively, as a result of low MS/MSD %R.
- J⁴ - Accept data, but qualify positive and nondetected results as estimated, (J) and (UJ) respectively, as a result of low post-digestion spike recovery.



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-04-8-026

TO: MARK SLADIC

DATE: MAY 13, 1998

FROM: DANA PIETO

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs, SVOCs, & PCBs
CTO 003, FRIDLEY, MINNESOTA
SDG BRF23

SAMPLES: Waters\VOC:

003-MS-30S-01	003-MS-30I-01	003-MS-33S-01	003-MS-33I-01
003-MS-DP2-01	003-MS-33D-01	003-MS-31D-01	003-MS-32S-01
003-TB-062-01	003-TB-063-01	003-TB-064-01	003-TB-065-01

Waters\SVOC\PCB:

003-MS-30S-01	003-MS-30I-01	003-MS-33S-01	003-MS-33I-01
003-MS-DP2-01	003-MS-33D-01	003-MS-31D-01	003-MS-32S-01

The sample set for the CTO 003, Fridley, SDG BRF23, consists of eight aqueous environmental samples, and four trip blanks (designated TB). The environmental samples were analyzed for Target Compound List (TCL) volatile, semivolatile, and PCB organic compounds. The trip blanks were analyzed for TCL volatile organic compounds only. One field duplicate pair (003-MS-33I-01 and 003-MS-DP2-01) was included in this SDG.

The samples were collected by Brown & Root Environmental on February 24, 25, 26, and 27, 1998, and analyzed by Laucks Testing Laboratories. The volatile, semivolatile, and PCB compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All volatile analyses were conducted using the SW-846 Method 8260B. All semivolatile and pesticide/PCB analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLC02.1) analytical and reporting protocols. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Detection limits
- * • Sample identification
- * • Sample quantitation
- * • Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data

MEMO TO: MARK SLADIC
 DATE: MAY 13, 1998 - PAGE 2

usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatiles

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound:</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>
Acetone*	5.5 µg/L	55 µg/L
Methylene chloride*	2.1 µg/L	21 µg/L

*Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: None

Sample aliquot and dilution factors were taken into consideration during the application of the action level. No action was warranted for acetone and methylene chloride since no positive results were reported for these compounds in the affected samples. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial calibration relative response factors (RRFs) were below 0.050 for acetone and 2-butanone. The continuing calibration RRFs were below 0.050 for acetone, 2-butanone, and 2-hexanone. The nondetected results were qualified as rejected. (UR).

The continuing calibration %Ds for trans-1,3-dichloropropene and carbon disulfide exceeded the 20% quality control criterion. Nondetected results were qualified as estimated. (UJ).

Trichloroethene exceeded the instrument's linear calibration range in sample 003-MS-30I-01. This sample was diluted 5-fold and reanalyzed. The dilution result for only this compound was transposed over to the original sample result and used in validation of this SDG.

Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trichloroethene exceeded the instrument's linear calibration range in sample 003-MS-32S-01. This sample was diluted 10-fold and reanalyzed. The dilution results for only these compounds were transposed over to the original sample results and used in validation of this SDG.

Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trichloroethene exceeded the instrument's linear calibration range in sample 003-MS-33I-01. This sample was diluted 500-fold and reanalyzed. Again, the results for trichloroethene exceeded the instrument's linear calibration range, therefore, the sample was diluted 2000-fold and reanalyzed. The dilution results for cis-1,2-dichloroethene and trans-1,2-dichloroethene were transposed over to the original sample results from the first dilution and used in validation of this SDG. The dilution result for trichloroethene was transposed over to the original sample results from the second dilution and used in validation of this SDG.

Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and trichloroethene exceeded the instrument's linear calibration range in sample 003-MS-DP2-01. This sample was diluted 500-fold and reanalyzed. Again, the results for trichloroethene exceeded the instrument's linear calibration range, therefore, the sample was diluted 2000-fold and reanalyzed. The dilution results for cis-1,2-dichloroethene and trans-1,2-dichloroethene were transposed over to the original sample results from the first dilution and used in validation of this SDG. The dilution result for trichloroethene was transposed over to the original sample results from the second dilution and used in validation of this SDG.

Trichloroethene exceeded the instrument's linear calibration range in sample 003-MS-33S-01. This sample was diluted 5-fold and reanalyzed. The dilution result for only this compound was transposed over to the original sample result and used in validation of this SDG.

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 - PAGE 3

It should be noted that the significant figures for the electronic data and the Form Is did not agree. The data reviewer has amended the electronic data to concur with the Form Is.

Semivolatiles

The following volatile compounds were detected in the laboratory method blanks at the maximum concentrations indicated below:

<u>Compound:</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>
Di-n-butylphthalate	1.0 µg/L	10 µg/L
bis(2-ethylhexyl)phthalate	1.0 µg/L	10 µg/L

Samples Affected: All

Sample aliquot and dilution factors were taken into consideration during the application of the action level. Positive results for the aforementioned compounds reported at concentrations below the action level were qualified as nondetects, (U).

The surrogate percent recovery (%R) for 2-fluorobiphenyl was below the lower quality control limit in sample 003-MS-33S-01MS. No action was warranted for this noncompliance since no action is taken for quality control samples.

The Matrix Spike Duplicate (MSD) relative percent difference (RPD) for 4-chloroaniline was greater than the upper quality control limit in sample 003-MS-33S-01. No action is taken based upon MSD noncompliances alone.

It should be noted that the laboratory truncated the sample identification on the Form Is. The data reviewer has amended the appropriate forms.

Pesticides/PCBs

The MSD %R for Aroclor 1016 was below the quality control limits for sample 003-MS-30I-01. No action is taken based upon MSD noncompliances alone.

No other problems were noted.

Executive Summary

Laboratory Performance: The volatile initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. The continuing calibration %Ds greater than the quality control limit were reported for trans-1,3-dichloropropene, 2-hexanone, and carbon disulfide. Methylene chloride was detected in the volatile laboratory method blanks.


Other Factors Affecting Data Quality: Acetone and methylene chloride were detected in the volatile field quality control blanks. Di-n-butylphthalate and bis(2-ethylhexyl)phthalate were detected in the semivolatile field quality control blanks.

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 - PAGE 4

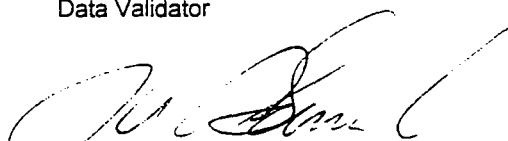
The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation" (2/94), as amended for use within EPA Region V modifications (8/93), and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Dana L. Piets

Brown & Root Environmental
Data Validator


Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF23**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile		Semivolatile	PCB
003-TB-062-01	J ^{1,3}	R ¹		
003-MS-30S-01	J ^{1,2}	R ¹	A ^{1,2}	
003-MS-30I-01	J ^{1,2}	R ¹	A ¹	
003-TB-063-01	J ^{1,3}	R ¹		
003-MS-33S-01	J ^{1,2}	R ¹	A ¹	
003-MS-33I-01	J ^{1,2}	R ¹	A ^{1,2}	
003-MS-DP2-01	J ^{1,2}	R ¹	A ¹	
003-TB-064-01	J ^{1,3}	R ¹		
003-MS-33D-01	J ^{1,3}	R ¹	A ¹	
003-MS-31D-01	J ^{1,2}	R ¹	A ¹	
003-TB-065-01	J ^{1,3}	R ¹		
003-MS-32S-01	J ³	R ¹	A ¹	

If field is left blank, the qualifier is A - accept all data.

- A¹ - Accept data, but qualify positive results for di-n-butylphthalate as nondetected, (U), as a result of laboratory method blank contamination.
- A² - Accept data, but qualify positive results for bis(2-ethylhexyl)phthalate as nondetected, (U), as a result of laboratory method blank contamination.
- J¹ - Accept data, but qualify positive results less than the CRQL as estimated, (J).
- J² - Accept data, but qualify nondetected results for trans-1,3-dichloropropene as estimated, (UJ), as a result of continuing calibration %Ds greater than 20%.
- J³ - Accept data, but qualify nondetected results for trans-1,3-dichloropropene and carbon disulfide as estimated, (UJ), as a result of continuing calibration %Ds greater than 20%.
- R¹ - Reject nondetected results for acetone, 2-butanone, and 2-hexanone as a result of initial and/or continuing calibration RRFs less than 0.05.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-053

TO: MARK SLADIC
FROM: SEAN NIXON
SUBJECT: INORGANIC DATA VALIDATION - ALAKLINITY, BROMIDE, CHLORIDE, HARDNESS, NITRATE, NITRITE, ORTHOPHOSPHATE, SULFATE, AND TOTAL SUSPENDED SOLIDS
CTO 003 - NIROP FRIDLEY
SDG - BRF23

DATE: APRIL 8, 1998

COPIES: DV FILE

SAMPLES: 8/Aqueous

003-MS-30I-01	003-MS-30S-01	003-MS-31D-01	003-MS-32S-01
003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01

8/Filtrate

003-MS-30I-F1	003-MS-30S-F1	003-MS-31D-F1	003-MS-32S-F1
003-MS-33D-F1	003-MS-33I-F1	003-MS-DP2-F1	003-MS-33S-F1

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF23 consists of eight (8) aqueous environmental samples and eight (8) corresponding filtrates. One (1) field duplicate pair, samples 003-MS-33I-01/003-MS-DP2-01 and 003-MS-33I-F1/003-MS-DP2-F1, was included within this SDG. Samples 003-MS-30I-01 and 003-MS-30I-F1 were specified for Matrix Spike/Matrix Spike Duplicate analysis by the field crew.

The unfiltered samples were analyzed for alkalinity, hardness, nitrate, nitrite, sulfate and total suspended solids. The filtered samples were analyzed for bromide, chloride, and orthophosphate. The samples were collected by Brown and Root Environmental on February 24, 25, 26, and 27, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The samples were analyzed for alkalinity according to EPA Method 310.0, for bromide, chloride, nitrate, nitrite, orthophosphate, and sulfate according to EPA Method 300.0, for hardness according to EPA Method 130.2, and for total suspended solids according to SM2540.

- Data Completeness
- * • Holding Times
- * • Calibration Issues
- * • Laboratory Blank Analyses
- * • Matrix Spike Results (MS)
- * • Duplicate Results
- * • Field Duplicate Results
- * • Laboratory Control Sample Results
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: APRIL 8, 1998 PAGE 2

C-49-04-8-053

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Data Completeness

Sample 003-MS-31D-01 was not analyzed for hardness.

Notes

A field duplicate comparison is presented in Appendix C.

Executive Summary

Laboratory Performance: No issues.

Other Factors Affecting Data Quality: No other issues affected data quality.


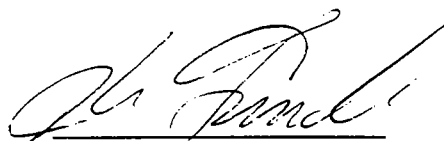
MEMO TO: MARK SLADIC
DATE: APRIL 8, 1998 PAGE 3

C-49-04-8-053

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental
Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF23**

TABLE 1 - RECOMMENDATION SUMMARY

Alkalinity
Bromide
Chloride
Hardness
Nitrate
Nitrite
Orthophosphate
Sulfate
Total suspended solids

If the field is left blank, the qualifier is A - Accept all data.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-034

TO: MARK SLADIC

DATE: MAY 13, 1998

FROM: SEAN NIXON

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF23

SAMPLES: 8/Aqueous

003-MS-30I-01	003-MS-30S-01	003-MS-31D-01	003-MS-32S-01
003-MS-33D-01	003-MS-33I-01	003-MS-DP2-01	003-MS-33S-01

8/Filtrate

003-MS-30I-F1	003-MS-30S-F1	003-MS-31D-F1	003-MS-32S-F1
003-MS-33D-F1	003-MS-33I-F1	003-MS-DP2-F1	003-MS-33S-F1

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF23 consists of eight (8) aqueous environmental samples and eight (8) corresponding filtrates. One (1) field duplicate pair, samples 003-MS-33I-01/003-MS-DP2-01 and 003-MS-33I-F1/003-MS-DP2-F1, were included within this SDG. Samples 003-MS-30I-01 and 003-MS-30I-F1 were specified for Matrix Spike/Matrix Spike Duplicate analysis by the field crew.

All samples were analyzed for Target Analyte List (TAL) metals and cyanide except the filtrates which were not analyzed for cyanide. The samples were collected by Brown and Root Environmental on February 24, 25, 26, and 27, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The aqueous and filtrate samples were prepared and analyzed according Contract Laboratory Procedure (CLP) ILM04.0. The laboratory analyzed all analytes via ICP methodology with the exception of arsenic, lead, mercury, selenium, thallium, and cyanide. Arsenic, lead, selenium, and thallium were analyzed via GFAA, while mercury was analyzed via CVAA. Cyanide was analyzed via wet chemistry methods. These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration Issues
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- Matrix Spike Results (MS)
- * • ICP Serial Dilution Results
- * • Duplicate Results
- Field Duplicate Results
- * • Laboratory Control Sample Results
- Post-digestion Spike Recovery
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 2

C-49-04-8-034

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

<u>Element</u>	<u>Maximum Concentration (ug/L)</u>	<u>Aqueous Action Level (ug/L)</u>
Aluminum	87.8	439
Arsenic	1.0	5.0
Barium	1.3	6.5
Calcium	122	610
Iron	33.2	166
Magnesium	60.3	302
Manganese	5.1	25.5
Selenium	3.2	16.0
Sodium	63.8	319
Zinc	17.0	85.0

Samples affected: All

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the associated action levels for the aforementioned elements were qualified as estimated, (J). Positive results less than the associated action levels for aluminum, arsenic, iron, manganese, selenium, and zinc have been qualified as nondetected (U).

Matrix Spike/Matrix Spike Duplicate

The MS/MSD analyses of sample 003-MS-30I-01 yielded a Percent Recovery below the 75% quality control limit for selenium. The nondetected results for selenium in the samples of the unfiltered matrix were qualified as estimated, (UJ).

The MS/MSD analyses of sample 003-MS-30I-F1 yielded a Percent Recovery below the 75% quality control limit for selenium. The nondetected results for selenium in the samples of the filtered matrix were qualified as estimated, (UJ).

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 3

C-49-04-8-034

Post-digestion Spike Results

Samples 003-MS-30S-01, 003-MS-31D-01, 003-MS-31D-F1, 003-MS-32S-01, and 003-MS-33I-F1 yielded post-digestion spike recoveries for thallium below the 85% quality control limit. The nondetected results for thallium in the aforementioned samples were qualified as estimated, (UJ).

Samples 003-MS-30I-F1, 003-MS-31D-01, 003-MS-31D-F1, 003-MS-32S-01, 003-MS-33D-01, 003-MS-33I-01, 003-MS-DP2-01, 003-MS-33I-F1, and 003-MS-DP2-F1 yielded post-digestion spike recoveries for selenium that were below the 85% quality control limit. The nondetected results for the selenium were qualified as estimated, (UJ), in the aforementioned samples.

Field Duplicate Results

Imprecision was noted for zinc in the field duplicate pair 003-MS-33I-01/003-MS-DUP2-01. The positive result for zinc in the unfiltered sample 003-MS-30I-01 was qualified as estimated. (J).

Notes

The Contract Required Detection Limits (CRDL) analyses yielded %Rs above the 120% quality control limit for mercury and selenium. However, no validation actions were taken for CRDL noncompliance.

The CRDL analysis yielded a %R below the 80% quality control limit for selenium. However, no validation actions were taken for CRDL noncompliance.

Several samples yielded low post-digestion spike recoveries for selenium. However, the positive results for selenium in these samples were qualified for blank contamination.

It should be noted that the Form Is truncated some results by omitting the decimal value. The data reviewer has amended the appropriate forms.

It should be noted that the corresponding filtrate (003-MS-32S-F1) of sample 003-MS-32S-01 yielded slightly higher results for arsenic, barium, calcium, chromium, iron, lead, magnesium, manganese, potassium, selenium, sodium, and zinc. No validation action was taken, but this issue is noted for completeness.

A field duplicate comparison is presented in Appendix C.

Executive Summary

Laboratory Performance: Blank contamination was noted for several elements.

Other Factors Affecting Data Quality: Low Matrix Spike/Matrix Spike Duplicate %Rs were noted for selenium. Imprecision was noted for zinc in the unfiltered field duplicate pair. Low post-digestion spike recoveries were noted for thallium and selenium in several samples.

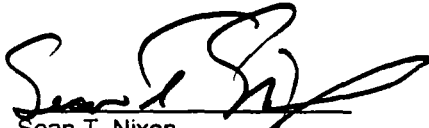
MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 4

C-49-04-8-034


The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental



Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF23**

TABLE 1 - RECOMMENDATION SUMMARY TAL METALS AND CYANIDE

Aluminum	A ¹ , J ¹	Magnesium	J ¹
Antimony		Manganese	A ¹ , J ¹
Arsenic	A ¹ , J ¹	Mercury	
Barium	J ¹	Nickel	
Beryllium		Potassium	
Cadmium		Selenium	A ¹ , J ^{2, 3, 5}
Calcium	J ¹	Silver	
Chromium		Sodium	A ¹
Cobalt		Thallium	J ⁵
Copper		Vanadium	
Cyanide		Zinc	A ¹ , J ^{1, 4}
Iron	A ¹ , J ¹		
Lead			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results in exceedance of the blank action level as estimated, (J).
- J² - Accept data, but qualify nondetected results of the unfiltered matrix as estimated, (UJ), as a result of low MS/MSD %R.
- J³ - Accept data, but qualify nondetected results of the filtered matrix as estimated, (UJ), as a result of low MS/MSD %R.
- J⁴ - Accept data, but qualify positive results for zinc as estimated, (J), as a result of field duplicate imprecision.
- J⁵ - Accept data, but qualify nondetected results as estimated, (UJ), as a result of low post-digestion spike recovery.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

TO: MR. MARK SLADIC DATE: MAY 13, 1998
FROM: LINDA KARSONOVICH COPIES: DV FILE
SUBJECT: ORGANIC DATA VALIDATION- VOA/SVOA/PCB ORGANICS
 CTO 003, NIROP FRIDLEY, MINNESOTA
 SDG BRF22

SAMPLES: 12/Aqueous/

003-MS-28D-01	003-MS-28I-01
003-MS-28S-01	003-MS-29D-01
003-MS-29I-01	003-MS-29S-01
003-MS-31I-01	003-MS-31S-01
003-TB-058-01	003-TB-059-01
003-TB-060-01	003-TB-061-01

OVERVIEW

The sample set for CTO 003, NIROP Fridley, SDG BRF22 consists of eight (8) aqueous environmental samples and four (4) field quality control blanks. All the samples were analyzed for Target Compound List (TCL) volatile organic compounds. The environmental samples were also analyzed for TCL semivolatile organic compounds and PCBs.

The samples were collected by Brown and Root Environmental on February 11th, 16th, 17th, and 18th, 1998 and analyzed by Laucks Testing Laboratory, Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B and CLP OLC02.0 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Data completeness
- * • Holding times
- * • GC/MS tuning and system performance
- Initial/continuing calibrations
- Laboratory method and field quality control blank results
- Surrogate spike recoveries
- Matrix Spike/Matrix Spike Duplicate Results
- * • Blank Spike/Blank Spike Duplicate Results
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation
- * • Detection Limits
- * • Tentatively Identified Compounds

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings are presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatile

Initial and/or continuing calibration Relative Response Factors (RRFs) less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Nondetected results reported in the affected samples were rejected, (UR).

The following table summarizes the maximum concentration of volatile compounds detected in the laboratory method and field quality control blanks (*) analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Methylene Chloride*	0.5 µg/L	5 µg/L
Acetone*	4.8 µg/L	48 µg/L

Samples affected: All

Dilution factors and sample aliquot used for analysis were taken into consideration during the application of all action levels. No validation action was required on the basis of blank contamination. It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

Dilutions were performed on samples which had compounds above the linear range of the instrument. The results from the dilution for the listed compounds only were transcribed over the undiluted sample results.

<u>Sample</u>	<u>Compound</u>	<u>DF</u>
003-MS-28S-01	cis-1,2-dichloroethene	10X
	trichloroethene	
003-28I-01	cis-1,2-dichloroethene	10X
	trichloroethene	
003-MS-29I-01	trichloroethene	50X
003-MS-29S-01	cis-1,2-dichloroethene	2X
003-MS-28D-01	trichloroethene	2X
003-MS-31S-01	cis-1,2-dichloroethene	10X
	trichloroethene	

Semivolatiles

Continuing calibration %Ds greater than 25% were reported for 4-nitrophenol (37%), carbazole (34%), and 3,3'-dichlorobenzidine (40%). Nondetected results reported for the aforementioned target compounds in the affected samples were qualified as estimated, (UJ).

The following table summarizes the maximum concentration of semivolatile compounds detected in the laboratory method and field quality control blanks analyzed in this SDG.

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Action Level</u>
Bis(2-ethylhexyl)phthalate	1µg/L	10 µg/L

Dilution factors and sample aliquot used for analysis were taken into consideration during the application of all action levels. Positive results reported for bis(2-ethylhexyl)phthalate considered false positives were qualified as nondetected, U.

Sample results for 003-MS-31I-01 were calculated using an incorrect final sample extract volume (1 µL versus 1000 µL). The laboratory was contacted and asked to resubmit results for this sample.

PCB

Two of the four surrogates fell below the lower quality control limit of 60% for TCX (tetrachloro-m-xylene) in the blank spike and sample 003-MS-31I-01. No validation action was required for the blank spike. Nondetected results in sample 003-MS-31I-01 were qualified as estimated, UJ.

Additional Comments

Positive results reported below the Contract Required Quantitation Limit (CRQL) are qualified as estimated, (J).

EXECUTIVE SUMMARY

Laboratory Performance Issues: Initial and continuing calibration RRFs were outside the 0.05 quality control limit. Methylene chloride, acetone, and bis(2-ethylhexyl)phthalate were detected in the laboratory method blanks. One PCB fraction sample contained low surrogate recoveries for TCX.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), USEPA Region V Standard Operating Procedures for the Validation of Organic Data (Aug. 1993), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."



Brown and Root Environmental

Linda Karsonovich
Chemist/Data Validator



Brown and Root Environmental

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

NIROP FRIDLEY

SDG BRF22

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA		PCB
003-MS-28D-01	R ¹	J ³	A ¹	J ^{1 3}	
003-MS-28I-01	R ¹		A ¹	J ¹	
003-MS-28S-01	R ¹	J ³	A ¹	J ¹	
003-MS-29D-01	R ¹	J ³	A ¹	J ¹	
003-MS-29I-01	R ¹	J ³	A ¹	J ¹	
003-MS-29S-01	R ¹	J ³	A ¹	J ¹	
003-MS-31I-01	R ¹		A ¹		J ²
003-MS-31S-01	R ¹	J ³	A ¹		
003-TB-058-01	R ¹	J ³			
003-TB-059-01	R ¹	J ³			
003-TB-060-01	R ¹	J ³			
003-TB-061-01	R ²	J ³			

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but replace positive results for bis(2-ethylhexyl) phthalate with a revised detection limit and qualify as nondetected, (U) as a result of laboratory method blank contamination.
- R¹ - Reject data, qualify nondetected results for acetone, 2-butanone, and 2-hexanone as rejected, (UR) due to initial calibration noncompliance.
- R² - Reject data, qualify nondetected results for 2-butanone and 2-hexanone as rejected, (UR) due to initial and/or continuing calibration noncompliance.
- J¹ - Accept data, but qualify nondetected results for 3,3'-dichlorobenzidine, 4-nitrophenol, and carbazole as estimated, (UJ), as a result of continuing calibration %Ds greater than the 30% quality control limit.
- J² - Accept data, but qualify nondetected results as estimated, (UJ), as a result of surrogate noncompliance.
- J³ - Accept data, but qualify positive results below the CRQL as estimated, (J).

Summary of Tentatively Identified Compounds (TICs)

Fraction	TIC
Volatile	None
Semivolatile	cyclohexanone 1-hexanol, 2-ethyl caprolactam sulfur, mol. (S8) unknown



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-062

TO: MARK SLADIC

DATE: APRIL 10, 1998

FROM: SEAN NIXON

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - ALAKLINITY, BROMIDE, CHLORIDE, HARDNESS,
NITRATE, NITRITE, ORTHOPHOSPHATE, SULFATE, AND TOTAL SUSPENDED SOLIDS
CTO 003 - NIROP FRIDLEY
SDG - BRF22

SAMPLES: 8/Aqueous

003-MS-28D-01
003-MS-29I-01

003-MS-28I-01
003-MS-29S-01

003-MS-28S-01
003-MS-31I-01

003-MS-29D-01
003-MS-31S-01

8/Filtrate

003-MS-28D-F1
003-MS-29I-F1

003-MS-28I-F1
003-MS-29S-F1

003-MS-28S-F1
003-MS-31I-F1

003-MS-29D-F1
003-MS-31S-F1

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF22 consists of eight (8) aqueous environmental samples and eight (8) corresponding filtrates. The field crew did not specify any samples for Matrix Spike/Matrix Spike Duplicate analysis.

The unfiltered samples were analyzed for alkalinity, hardness, nitrate, nitrite, sulfate and total suspended solids. The filtered samples were analyzed for bromide, chloride, and orthophosphate. The samples were collected by Brown and Root Environmental on February 11, 16, 17, and 18, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The samples were analyzed for alkalinity according to EPA Method 310.0, for bromide, chloride, nitrate, nitrite, orthophosphate, and sulfate according to EPA Method 300.0, for hardness according to EPA Method 130.2, and for total suspended solids according to SM2540.

- * • Data Completeness
- * • Holding Times
- * • Calibration Issues
- * • Laboratory Blank Analyses
- * • Matrix Spike Results (MS)
- * • Duplicate Results
- * • Field Duplicate Results
- * • Laboratory Control Sample Results
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: APRIL 10, 1998 PAGE 2

C-49-04-8-062

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Matrix Spike Results

- The Matrix Spike (MS) analysis of sample 003-MS-28S-01 yielded a Percent Recovery (%R) above the 115% laboratory quality control limit for sulfate. The positive results for sulfate were qualified as estimated, (J), in all of the samples.

Notes

The Laboratory Control Sample (LCS), or Standard Reference Material (SRM), yielded a %R above the laboratory quality control limit for nitrite, but was within SRM quality control limits. Since only nondetected results were reported for nitrite in the samples and the LCS was within the SRM quality control limits, no action was taken.

Executive Summary

Laboratory Performance: No issues.

Other Factors Affecting Data Quality: A high MS %R was noted for sulfate.

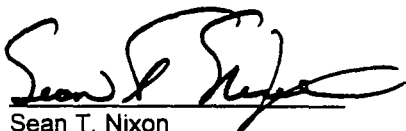
MEMO TO: MARK SLADIC
DATE: APRIL 10, 1998 PAGE 3

C-49-04-8-062

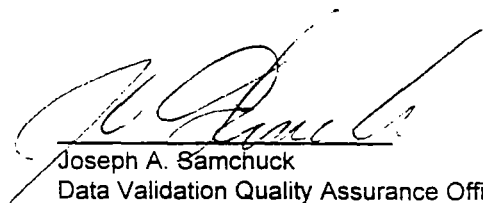
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental



Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF22**

TABLE 1 - RECOMMENDATION SUMMARY

Alkalinity	
Bromide	
Chloride	
Hardness	
Nitrate	
Nitrite	
Orthophosphate	
Sulfate	J ¹
Total suspended solids	

If the field is left blank, the qualifier is A - Accept all data.

J¹ - Accept data, but qualify positive results as estimated, (J), as a result of high MS %R.



Brown & Root Environmental

INTERNAL CORRESPONDENCE

C-49-04-8-051

TO: MARK SLADIC

DATE: MAY 13, 1998

FROM: SEAN NIXON

COPIES: DV FILE

SUBJECT: INORGANIC DATA VALIDATION - TAL METALS AND CYANIDE
CTO 003 - NIROP FRIDLEY
SDG - BRF22

SAMPLES: 8/Aqueous

003-MS-28D-01	003-MS-28I-01	003-MS-28S-01	003-MS-29D-01
003-MS-29I-01	003-MS-29S-01	003-MS-31I-01	003-MS-31S-01

8/Filtrate

003-MS-28D-F1	003-MS-28I-F1	003-MS-28S-F1	003-MS-29D-F1
003-MS-29I-F1	003-MS-29S-F1	003-MS-31I-F1	003-MS-31S-F1

Overview

The sample set for CTO 003 NIROP Fridley, SDG BRF22 consists of eight (8) aqueous environmental samples and eight (8) corresponding filtrates. The field crew did not specify a sample for Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis

All samples were analyzed for Target Analyte List (TAL) metals and cyanide, except the filtrates, which were not analyzed for cyanide. The samples were collected by Brown and Root Environmental on February 11, 16, 17, and 18, 1998 and analyzed by Laucks Testing Laboratories Incorporated under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. The aqueous and filtrate samples were prepared and analyzed according Contract Laboratory Procedure (CLP) ILM04.0. The laboratory analyzed all analytes via ICP methodology with the exception of arsenic, lead, mercury, selenium, thallium, and cyanide. Arsenic, lead, selenium, and thallium were analyzed via GFAA, while mercury was analyzed via CVAA. Cyanide was analyzed via wet chemistry methods. These data were evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration Issues
- Laboratory Blank Analyses
- * • ICP Interference Check Sample Results
- Matrix Spike Results (MS)
- * • ICP Serial Dilution Results
- * • Duplicate Results
- * • Field Duplicate Results
- * • Laboratory Control Sample Results
- Post-digestion Spike Recoveries
- * • Sample Quantitation
- * • Detection Limits

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 2

C-49-04-8-051

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

<u>Element</u>	<u>Maximum Concentration (ug/L)</u>	<u>Aqueous Action Level (ug/L)</u>
Aluminum ¹	116.4	582
Barium	1.2	6.0
Calcium ¹	126.4	632
Iron ¹	16.1	80.5
Magnesium ¹	23.0	115
Manganese	1.4	7.0
Sodium ¹	112.9	564
Zinc ¹	3.2	16.0

Samples affected: All

¹ Maximum concentration found in preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Dilution factors were taken into consideration when evaluating for blank contamination. Positive results greater than the associated action levels for barium, calcium, iron, magnesium, manganese, sodium, and zinc were qualified as estimated, (J). Positive results less than the associated action levels for barium and zinc have been qualified as nondetected (U).

Matrix Spike/Matrix Spike Duplicate

The MS/MSD analyses of sample 003-MS-29I-01 yielded a Percent Recovery below the 75% quality control limit for lead and selenium. The nondetected results for lead and selenium in the samples of the unfiltered matrix were qualified as estimated, (UJ).

The MS/MSD analyses of sample 003-MS-29I-F1 yielded a Percent Recovery below the 75% quality control limit for lead and selenium. The nondetected results for lead and selenium in the samples of the filtered matrix were qualified as estimated, (UJ).

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 3

C-49-04-8-051

Post-digestion Spike Results

All of the samples yielded post-digestion spike recoveries for lead and selenium below the 85% quality control limit. The nondetected results for lead and selenium in all the samples were qualified as estimated, (UJ).

Sample 003-MS-29S-01 yielded a post-digestion spike recovery for thallium below the 85% quality control limit. The positive result for thallium in the aforementioned sample was qualified as estimated, (J).

Notes

The Contract Required Detection Limits (CRDL) analyses yielded a %R above the 120% quality control limit for mercury. However, no validation actions were taken for CRDL noncompliance.

The CRDL analyses yielded %Rs below the 80% quality control limit for lead. However, no validation actions were taken for CRDL noncompliance.

The laboratory failed to report the correct number of significant figures for several analytes. The data reviewer has amended the appropriate forms.

It should be noted that the corresponding filtrate (003-MS-28S-F1) of sample 003-MS-28S-01 yielded slightly higher results for barium, calcium, chromium, iron, magnesium, manganese, nickel, selenium, sodium, and zinc. The laboratory stated that this minor difference is likely a result of aliquoting differences between the samples. No validation action was taken, but this issue is noted for completeness.

Executive Summary

Laboratory Performance: Blank contamination was noted for several elements.

Other Factors Affecting Data Quality: Low Matrix Spike/Matrix Spike Duplicate %Rs were noted for lead and selenium. Low post-digestion spike recoveries were noted for lead and selenium in all the samples, and for thallium in sample 003-MS-29S-01.

MEMO TO: MARK SLADIC
DATE: MAY 13, 1998 PAGE 4

C-49-04-8-051

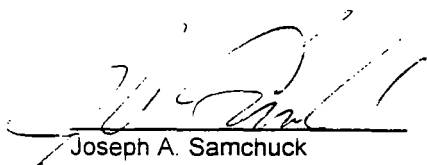
The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review" February 1994, EPA Region V Standard Operating Procedures for Validation of CLP Inorganic Data", September 1993, and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."



Sean T. Nixon
Chemist/Data Validator
Brown and Root Environmental



Joseph A. Samchuck
Data Validation Quality Assurance Officer
Brown and Root Environmental

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation.

**NIROP FRIDLEY
SDG BRF22**

TABLE 1 - RECOMMENDATION SUMMARY TAL METALS AND CYANIDE

Aluminum		Magnesium	J ¹
Antimony		Manganese	J ¹
Arsenic		Mercury	
Barium	A ¹ , J ¹	Nickel	
Beryllium		Potassium	
Cadmium		Selenium	J ^{2, 3, 4}
Calcium	J ¹	Silver	
Chromium		Sodium	J ¹
Cobalt		Thallium	J ⁴
Copper		Vanadium	
Cyanide		Zinc	A ¹ , J ¹
Iron	J ¹		
Lead	J ^{2, 3, 4}		

If the field is left blank, the qualifier is A - Accept all data.

- A¹ - Accept data, but qualify as nondetected, (U), as a result of laboratory blank contamination.
- J¹ - Accept data, but qualify positive results in exceedance of the blank action level as estimated, (J).
- J² - Accept data, but qualify nondetected results of the unfiltered matrix as estimated, (UJ), as a result of low MS/MSD %R.
- J³ - Accept data, but qualify nondetected results of the filtered matrix as estimated, (UJ), as a result of low MS/MSD %R.
- J⁴ - Accept data, but qualify positive and nondetected results as estimated, (J) and (UJ) respectively, as a result of low post-digestion spike recovery.



INTERNAL CORRESPONDENCE

Brown & Root Environmental

C-49-01-8-162

TO: MARK SLADIC

DATE: MARCH 25, 1998

FROM: DANA PIETO .

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION - VOCs
CTO 003, NIROP FRIDLEY, MINNESOTA
SDG BRF21

SAMPLES: Soils\VOA:

003-SB-32D-10
003-SB-DP2-06

003-SB-32D-11
003-SB-DP2-07

003-SB-32D-12
003-SB-DP2-08

003-SB-32D-13

Waters\VOA:

003-BB-011-01

The sample set for the CTO 003 NIROP Fridley, SDG BRF19, consists of seven soil environmental samples and one batch blank (designated BB). All soil samples were analyzed for Target Compound List (TCL) volatile organic compounds. The duplicate pair 003-SB-32D-12 and 003-SB-DP2-08 was found in this SDG. The samples 003-SB-32D-02 and 003-SB-32D-05 found in SDG BRF20 contained field duplicates 003-SB-DP2-06 and 003-SB-DP2-07, respectively, for this SDG.

The samples were collected by Brown & Root Environmental on December 8 and 9, 1997, and analyzed by Laucks Testing Laboratories. The volatile compound analyses were analyzed under Naval Facilities Engineering Service Center (NFESC). All soil analyses were conducted using the U.S. EPA Contract Laboratory Program (CLP) (OLM03.1) analytical and reporting protocols. All aqueous analyses were conducted using SW846 Method 8260A. The data were evaluated according to the following parameters:

- * • Data completeness
- * • Holding times
- * • GC/MS tuning and mass calibration
- Initial and continuing calibrations
- Laboratory and field blank analyses
- * • Surrogate spike recoveries
- * • Laboratory control sample results
- * • Internal standard performance
- * • Detection limits
- * • Field Duplicate Precision
- * • Sample identification
- Sample quantitation
- * • Tentatively Identified Compounds (TICs)

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

MEMO TO: MARK SLADIC
 DATE: JANUARY 26, 1998 - PAGE 2

Volatiles

All positive results reported at concentrations less than the Contract required Quantitation Limit (CRQL) were qualified as estimated, (J).

The following volatile compounds were detected in the laboratory method and/or field quality control blanks at the maximum concentrations indicated below:

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Aqueous Action Level</u>	<u>Soil Action Level</u>
Methylene chloride	3.0 µg/kg	—	30 µg/kg
Chloromethane*	0.2 µg/L	—	2.0 µg/kg
Chloroform*	21 µg/L	—	210 µg/kg
Bromodichloromethane*	0.2 µg/L	—	2.0 µg/kg
Methylene chloride	0.3 µg/L	3.0 µg/L	—

*Maximum concentration of contaminant detected in a field quality control blank.

Samples Affected: All.

Sample aliquot, dilution factors, and percent moisture were taken into consideration during the application of the action level. Positive results for the compound reported at concentrations below the detection limit were replaced with revised detection limits and qualified as nondetects, (BU). Positive results for the compound reported at concentrations above the detection limit were qualified as nondetected, (BJ). It should be noted that field quality control blanks are not qualified based on field quality control blank contamination.

The initial and continuing calibration Relative Response Factors (RRFs) for acetone, 2-butanone, and 2-hexanone were below the 0.05 minimum requirement. This calibration noncompliance indicates a lack of consistency in instrumental responses which could lead to compromised quantitation of positive and nondetected results for the affected compound. Nondetected results were considered to be unusable and were rejected (UR).

The continuing calibration Percent Difference (%D) exceeded the 25% quality control limit for 2-hexanone, bromomethane, chloroethane, and acetone. Nondetected results reported for these compounds in the affected samples were qualified as estimated (UJ).

The matrix spike/matrix spike duplicate (MS/MSD) analyses displayed low Percent Recoveries (%Rs) for trichloroethene, benzene, toluene, and chlorobenzene. Positive results reported for these compounds in the affected sample were qualified as estimated (J), and nondetected results were qualified as estimated, (UJ).

All soil samples were diluted 10-fold.

No other problems were noted.

Executive Summary

Laboratory Performance: The initial and continuing calibration RRFs less than the 0.05 quality control limit were reported for acetone, 2-butanone, and 2-hexanone. Continuing calibration %Ds for 2-hexanone, bromomethane, chloroethane, and acetone exceeded the 25% quality control limit. Methylene chloride was detected in laboratory method blanks.

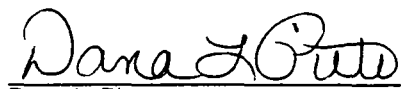
MEMO TO: MARK SLADIC
DATE: JANUARY 26, 1998 - PAGE 3

Other Factors Affecting Data Quality: Chloromethane, methylene chloride, chloroform and bromodichloromethane were detected in the field quality control blanks.

The data for these analyses were reviewed with reference to method-specific quality control criteria, the "National Functional Guidelines for Organic Data Evaluation", as amended for use within EPA Region V, and the NFESC Interim Guidance Document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide" (February 1996).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."


Dana L. Pioto

Brown & Root Environmental
Data Validator


Joseph A. Samchuck

Brown & Root Environmental
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

**NIROP FRIDLEY
SDG NO. BRF21**

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile			
003-SB-32D-10	A ¹	J ^{1,4}		
003-SB-32D-11	A ¹	J ^{1,4}		
003-SB-32D-12	A ¹	J ¹		
003-SB-32D-13	A ¹	J ¹		
003-SB-DP2-06	A ¹	J ^{1,4}		
003-SB-DP2-07	A ¹	J ^{1,4}		
003-SB-DP2-08	A ¹	J ^{1,2,3,4}		
003-BB-011-01	A ¹	J ⁴	R ¹	

- A¹ - Accept data, but qualify positive results estimated (U) for methylene chloride as a result of laboratory method blank contamination.
- J¹ - Accept data, but qualify nondetected results as estimated (UJ) for bromomethane and chloroethane as a result of continuing calibration %Ds greater than 25%.
- J² - Accept data, but qualify positive results estimated (J) for trichloroethene as a result of MS/MSD %Rs below the quality control limits.
- J³ - Accept data, but qualify nondetected results estimated (UJ) for benzene, toluene, and chlorobenzene as a result of MS/MSD %Rs below the quality control limits.
- J⁴ - Accept data, but qualify positive results < CRQL as estimated, (J).
- R¹ - Reject nondetected results for acetone, 2-butanone, and 2-hexanone as a result of initial and continuing calibrations RRFs less than 0.05.

APPENDIX G

SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT

APPENDIX G

- G.1 INDUSTRIAL WORKER SPREADSHEETS**
- G.2 MAJOR INFREQUENT CONSTRUCTION WORKER SPREADSHEETS**
- G.3 MINOR FREQUENT CONSTRUCTION WORKER SPREADSHEETS**
- G.4 SHALLOW ZONE GROUNDWATER SPREADSHEETS**
- G.5 INTERMEDIATE ZONE GROUNDWATER SPREADSHEETS**
- G.6 DEEP ZONE GROUNDWATER SPREADSHEETS**
- G.7 SAMPLE CALCULATIONS**
- G.8 SCREENING EVALUATION FOR EXPOSURES TO SURFACE AND
SUBSURFACE SOIL (0 TO 12 FEET) INDUSTRIAL WORKERS AND
MINOR FREQUENT CONSTRUCTION WORKERS**

APPENDIX G.1
INDUSTRIAL WORKER SPREADSHEETS

October 1997 Working Draft Tier II Generic -- Industrial Human Health-Based Soil Reference Values (SRV)

NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).
If multiple contaminants are present cumulative risk MUST be evaluated. Soil reference values may not be protective of impacts to ecological receptors and to ground water. Impacts to ecological receptors and/or ground water must be evaluated by utilizing other methods.

Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ / SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR / SRV).
Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).

Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site Exposure Point Conc. (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)													CANCER (RISK per 100,000) (1)		
					ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY		
Inorganics:																				
Aluminum	7429-90-5	100000	0.004	0.004	b			0.004					0.004						NA	NA
Antimony	7440-36-0	100	0.005	0.005		0.005											0.005		NA	NA
Arsenic	7440-38-2	22	0.008	0.008		0.008	0.008						0.008						1.40E-06	A
Barium	7440-39-3	12500	0.001	0.001		0.001							0.001						NA	NA
Beryllium	7440-41-7	7	0.000	0.000															2.66E-07	B2
Boron	7440-42-8	23000	0.000	0.000									0.000	0.000					NA	D
Cadmium	7440-43-9	150	0.000	0.000						0.000									1.16E-10	c B1
Chromium III	16065-83-1	100000	0.000	0.000	b														NA	NA
Chromium VI	18540-29-9	155	0.003	0.003															1.32E-08	c A
Cobalt	7440-48-4	13000	0.000	0.000		0.000			0.000					0.000					NA	D
Copper	7440-50-8	9000	0.001	0.001	b						0.001								NA	D
Cyanide, free	57-12-5	5000	0.000	0.000	b		0.000										0.000	0.000	NA	NA
Lead	7439-92-1	700	0.027	0.027	b	Based on blood lead levels. HQ > 1 blood lead levels may exceed 10 ug/dl.													NA	B2
Manganese	7439-96-5	3200	0.037	0.037			0.037												NA	D
Mercury (methyl mercury)	22967-92-6	22	0.000	0.000			0.000						0.000						NA	NA
Mercury (inorganic: elemental and mercuric ch. v	7439-97-6/7487-94-2	2	0.004	0.004			0.004		0.004										NA	D
Nickel	various	3000	0.001	0.001	b												0.001		1.58E-09	c A
Selenium	7782-49-2	1250	0.000	0.000	b	0.000	0.000				0.000			0.000					NA	D
Silver	7440-22-4	1250	0.000	0.000	b									0.000					NA	D
Thallium	various	21	0.002	0.002	b	0.002							0.002						NA	D
Tin	various	100000	0.000	0.000	b					0.000	0.000								NA	D
Vanadium	7440-62-2/1	1300	0.002	0.002	b														NA	D
Zinc	7440-66-6	70000	0.000	0.000	b	0.000													NA	D
Volatile Organics																				
Acetone	67-64-1	16000	0.000	0.000			0.000			0.000	0.000								NA	D
Benzene	71-43-2	4	0.000	0.000	c	0.000													0.00E+00	A
Bromodichloromethane	75-27-4	5	0.000	0.000						0.000									0.00E+00	B2
Bromomethane (methyl bromide)	74-83-9	3.5	0.000	0.000							0.000			0.000					NA	D
1,3 - Butadiene	106-99-0	0.1	NA	NA															0.00E+00	c B2
n-Butylbenzene	104-51-8	182	0.000	0.000															NA	NA
sec-Butylbenzene	135-98-8	234	0.000	0.000															NA	NA
tert-Butylbenzene (surrogate - n-butylbenzene)	98-06-6	182	0.000	0.000															NA	NA
Butyl benzylphthalate	85-68-7	37000	0.000	0.000							0.000								NA	C
Carbon Disulfide	75-15-0	255	0.000	0.000	b		0.000						0.000						NA	NA
Carbon Tetrachloride	56-23-5	0.8	0.000	0.000									0.000						0.00E+00	B2
Chlorobenzene	108-90-7	32	0.000	0.000						0.000	0.000								NA	D
Chloroethane (ethyl chloride)	75-00-3	1484	0.000	0.000									0.000						NA	NA
Chloroform (trichloromethane)	67-66-3	4	0.000	0.000									0.000						0.00E+00	B2
Chloromethane (methyl chloride)	74-87-3	21	NA	NA															0.00E+00	C
2-Chlorotoluene	95-49-8	436	0.000	0.000															NA	NA
Cumene (isopropylbenzene)	98-82-8	187	0.000	0.000															NA	NA
1,2 - Dibromoethane (ethylene dibromide)	106-93-4	0.25	0.000	0.000	c								0.000						0.00E+00	B2
Dibromomethane (methylene bromide)	74-95-3	1800	0.000	0.000		0.000													NA	NA

October 1997 Working Draft Tier II Generic - - Industrial Human Health-Based Soil Reference Values (SRV)

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Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ/SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR/SRV).
Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).

Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site Concentration (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)														CANCER	
					ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY	(RISK per 100,000) (1)	
Dichlorodifluoromethane (Freon 12)	75-71-8	50	0.000	0.000							0.000							0.000	NA	NA
1,1 - Dichloroethane	75-34-3	50	0.000	0.000						0.000									1.10E-09	C
1,2 - Dichloroethane	107-06-2	5	0.000	0.000															0.00E+00	B2
1,1 - Dichloroethylene	75-35-4	0.7	0.000	0.000															0.00E+00	C
cis - 1,2 - Dichloroethylene	154-59-2	2200	0.000	0.000		0.000													NA	D
trans - 1,2 - Dichloroethylene	156-60-5	425	0.000	0.000															NA	D
1,2 - Dichloroethylene (mixed isomers)	540-59-0	380	0.000	0.000															NA	D
Dichloromethane (methylene chloride)	75-09-2	150	0.000	0.000															0.00E+00	B2
1,2 - Dichloropropane	78-87-5	15	0.000	0.000										0.000					0.00E+00	B2
Ethyl benzene	100-41-4	190	0.000	0.000	Csat utilized					0.000	0.000		0.000						NA	D
Methyl ethyl ketone (2-butanone)	78-93-3	4300	0.000	0.000									0.000					0.000	NA	D
Methyl isobutyl ketone (MIBK)	108-10-1	420	0.000	0.000						0.000	0.000								NA	NA
Naphthalene	91-20-3	5.5	0.003	0.003		0.003		0.003						0.003					NA	D
n-Propylbenzene (surrogate - Cumene)	103-65-1	187	0.000	0.000	Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
Styrene	100-42-5	350	0.000	0.000		0.000					0.000								9.43E-10	B2
1,1,1,2 - Tetrachloroethane	630-20-6	42	0.000	0.000						0.000	0.000								0.00E+00	C
1,1,2,2 - Tetrachloroethane	79-34-5	8.5	0.000	0.000							0.000							0.000	0.00E+00	C
Tetrachloroethylene (PCE)	127-18-4	320	0.000	0.000			0.000			0.000	0.000								1.03E-09	B2
Toluene	108-88-3	420	0.000	0.000			0.000			0.000	0.000			0.000					NA	D
1,2,4 - Trichlorobenzene	120-82-1	1120	0.000	0.000	0.000						0.000								NA	D
1,1,1 - Trichloroethane	71-55-6	854	0.000	0.000	Csat Utilized		0.000				0.000								NA	D
1,1,2 - Trichloroethane	79-00-5	11	0.000	0.000		0.000			0.000		0.000								0.00E+00	C
Trichloroethylene (TCE)	79-01-6	55	NA	NA															1.46E-08	B2
Trichlorofluoromethane	75-69-4	200	0.000	0.000														0.000	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 11)	76-13-1	1485	0.000	0.000	Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
1,2,4-Trimethylbenzene	95-63-6	27	0.000	0.000			0.000			0.000	0.000							0.000	NA	NA
1,3,5-Trimethylbenzene	108-67-8	11.5	0.000	0.000			0.000			0.000	0.000							0.000	NA	NA
Vinyl chloride	75-01-4	0.3	0.000	0.000							0.000								0.00E+00	A
Xylenes (mixed)	1330-20-7	268	0.000	0.000	Csat Utilized		0.000							0.000				0.000	NA	D
Non/Semi Volatile Organics																				
Benzyl alcohol	100-51-6	55250	0.000	0.000							0.000								NA	NA
Bis (2 - chloroethyl) ether	111-44-4	0.8	NA	NA															0.00E+00	B2
Bis (chloromethyl) ether	542-88-1	0.0035	NA	NA															0.00E+00	A
Bromoform (tribromomethane)	75-25-2	3200	0.000	0.000							0.000								0.00E+00	B2
Butyl benzylphthalate	85-88-7	37000	0.000	0.000							0.000								NA	C
Dibenzofuran	132-64-9	120	0.002	0.002	Csat utilized. If > 1 indicates potential for free pro					0.002									NA	NA
1,4 - Dibromobenzene	106-37-6	1760	0.000	0.000							0.000								NA	NA
Dibromochloromethane	124-48-1	315	0.000	0.000							0.000								0.00E+00	b C
Dibutyl phthalate	84-74-2	18400	0.000	0.000														0.000	NA	D
1,2 - Dichlorobenzene	95-50-1	590	0.000	0.000														0.000	NA	D
1,3 - Dichlorobenzene	541-73-1	575	0.000	0.000														0.000	NA	D
1,4 - Dichlorobenzene	106-46-7	50	0.000	0.000						0.000	0.000								0.00E+00	C
3,3' - Dichlorobenzidine	91-94-1	57	NA	NA															0.00E+00	b B2
2,4-Dichlorophenol	120-83-2	370	0.000	0.000					0.000										NA	NA
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalat	117-81-7	2100	0.000	0.000							0.000								1.55E-09	b B2

October 1997 Working Draft Tier II Generic -- Industrial Human Health-Based Soil Reference Values (SRV)

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Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)														CANCER (RISK per 100,000) (1)	
				ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY		
2,4-Dimethylphenol	105-67-9	4000	0.000	b	0.000	0.000												NA	NA
Di-n-octyl phthalate	117-84-0	3700	0.000	b					0.000	0.000								NA	NA
2-Methylphenol (o-cresol)	95-48-7	5800	0.000	b		0.000											0.000	NA	C
3-Methylphenol (m-cresol)	108-39-4	5800	0.000	b		0.000											0.000	NA	C
4-Methylphenol (p-cresol)	106-44-5	580	0.000	b		0.000							0.000					NA	C
N-Nitrosodiphenylamine	88-30-6	3000	NA															0.00E+00	b B2
N-Nitrosodi-N-propylamine	621-64-7	4	NA															0.00E+00	b B2
Pentachlorophenol	87-86-5	150	0.000						0.000	0.000								0.00E+00	B2
Phenol	108-95-2	34000	0.000	b								0.000						NA	D
2,3,4,6-Tetrachlorophenol	58-90-2	3700	0.000							0.000								NA	NA
2,4,5-Trichlorophenol	95-95-4	12000	0.000	b					0.000	0.000								NA	NA
2,4,6-Trichlorophenol	88-06-2	1730	NA															0.00E+00	B2
Polyaromatic Hydrocarbons																			
Acenaphthene	83-32-9	90	0.002															NA	NA
Anthracene	120-12-7	5	0.043															NA	D
Benz[a]anthracene	56-55-3	35	NA															9.71E-08	B2
Benzo[b]fluoranthene	205-99-2	35	NA															9.09E-08	B2
Benzo[k]fluoranthene	207-08-9	350	NA															7.71E-09	B2
Benzo[a]pyrene (or BaP equivalents)	50-32-8	3.5	NA															8.03E-07	B2
Chrysene	218-01-9	3500	NA															8.74E-10	B2
Dibenz[ah]anthracene	53-70-3	3.5	NA															6.80E-07	B2
Fluoranthene	206-44-0	6400	0.000	b	0.000				0.000	0.000								NA	D
Fluorene	86-73-7	3564	0.000		Csat Util	0.000												NA	D
Indeno[1,2,3-cd]pyrene	193-39-5	35	NA															7.43E-08	B2
Naphthalene - see Volatile Organics																			
Pyrene	129-00-0	5300	0.000						0.000									NA	D
Quinoline	91-22-5	2	NA															0.00E+00	b C
Polychlorinated Biphenyls																			
PCBs (Polychlorinated Biphenyls)	1336-36-3	3.5	0.003	b			0.003	0.003				0.003						4.20E-08	b B2
MDA Pesticides and Herbicides																			
Aldrin	309-00-2	2	0.000	b						0.000								0.00E+00	B2
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	2200	0.000	b	0.000				0.000	0.000								NA	NA
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	94-82-6	1750	0.000	b	0.000					0.000								NA	NA
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-75-6	110	0.000	b					0.000	0.000								NA	NA
2-(2-Methyl-4-chlorophenoxy)propionic acid (MCP)	93-65-2	220	0.000	b					0.000									NA	NA
Metolachlor	51218-45-2	33000	0.000	b														NA	C
Picloram	1919-02-1	15400	0.000							0.000								NA	NA
Terbufos	13071-79-9	3	0.000	b		0.000												NA	NA
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-78-5	2200	0.000	b					0.000			0.000						NA	NA
Dioxins and Furans																			
2,3,7,8-TCDD (or 2,3,7,8-TCDD equivalents)	1746-01-6	0.00035	NA															0.00E+00	B2
1,2,3,7,8-PeCDD	0	0.0007	NA															0.00E+00	B2

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Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)														CANCER (RISK per 100,000) (1)	
				ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY		
1,2,3,4,7,8-HxCDD	0	0.0035	NA															0.00E+00	B2
1,2,3,6,7,8-HxCDD	0	0.0035	NA															0.00E+00	B2
1,2,3,7,8,9-HxCDD	0	0.0035	NA															0.00E+00	B2
1,2,3,4,6,7,8-HpCDD	0	0.035	NA															0.00E+00	B2
1,2,3,4,6,7,8,9-OCDD	0	0.35	NA															0.00E+00	B2
2,3,7,8-TCDF	0	0.0035	NA															0.00E+00	B2
1,2,3,7,8-PeCDF	0	0.007	NA															0.00E+00	B2
2,3,4,7,8-PeCDF	0	0.0007	NA															0.00E+00	B2
1,2,3,4,7,8-HxCDF	0	0.0035	NA															0.00E+00	B2
1,2,3,6,7,8-HxCDF	0	0.0035	NA															0.00E+00	B2
2,3,4,6,7,8-HxCDF	0	0.0035	NA															0.00E+00	B2
1,2,3,7,8,9-HxCDF	0	0.0035	NA															0.00E+00	B2
1,2,3,4,6,7,8-HpCDF	0	0.035	NA															0.00E+00	B2
1,2,3,4,7,8,9-HpCDF	0	0.035	NA															0.00E+00	B2
1,2,3,4,6,7,8,9-OCDF	0	0.35	NA															0.00E+00	B2
Explosives																			
1,3 - DNB	99-65-0	12	0.000	b												0.000		NA	D
2,4 - DNT	121-14-2	380	0.000	b	0.000	0.000				0.000								see mixture	
2,6 - DNT	606-20-2	175	0.000	b	0.000	0.000			0.000	0.000								see mixture	
2,4 - AND 2,6 DNT MIXTURE		36	NA															0.00E+00	b B2
HMX	2691-41-0	9500	0.000	b						0.000								NA	D
RDX	121-82-4	65	0.000	b							0.000							0.00E+00	b C
1,3,5 - TNB	99-35-4	8	0.000	b												0.000		NA	C
2,4,6 - TNT	118-96-7	60	0.000	b						0.000								0.00E+00	b C
Other Organics																			
Benzoic acid	65-85-0	100000	0.000	b	Soil Maximum Utilized													NA	
Hexane	110-54-3	31	0.000			0.000						0.000	0.000					NA	NA
Additional Pesticides and Herbicides																			
gamma-BHC (Lindane)	58-89-9	20	0.000	b					0.000	0.000								0.00E+00	b B2
Chloramben	133-90-4	3300	0.000							0.000								NA	NA
Chlordane	57-74-9	13	0.000							0.000								0.00E+00	B2
4, 4' - DDD	75-54-8	125	NA															0.00E+00	b B2
4, 4' - DDE	72-55-9	88	NA															0.00E+00	b B2
4, 4' - DDT	50-29-3	88	0.000	b						0.000								0.00E+00	B2
Diazinon	333-41-5	200	0.000	b		0.000												NA	NA
Dieldrin	60-57-1	2	0.000	b						0.000								0.00E+00	B2
Endosulfan	115-29-7	700	0.000	b	0.000	0.000			0.000									NA	NA
Endrin	72-20-8	65	0.000	b		0.000				0.000								NA	D
Heptachlor	76-44-8	7	0.000	b						0.000								0.00E+00	B2
Heptachlor epoxide	1024-57-3	3	0.000	b						0.000								0.00E+00	B2
Methoxychlor	72-43-5	690	0.000	b								0.000						NA	D
Toxaphene	8001-35-2	28	NA															0.00E+00	B2

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Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site Conc. (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)													CANCER	
					ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY	(RISK per 100,000) (1)
				Cumulative Risk Level (1) =	0.000	0.019	0.053	0.006	0.007	0.002	0.001	0.000	0.009	0.003	0.008	0.000	0.000	0.006	3.50E-06
v - considered volatile. Default values of 10% soil moisture, 0.5% soil organic carbon and a 5 acre source area are utilized in Volatilization Model calculations. If site-specific values differ significantly a site-specific re-calculation should be done.																			
indicates that the theoretical soil saturation limit (Csat) is < SRV. Csat concentration represents the concentration above which free-phase liquid contamination may be present.																			
b Risk based on ingestion and dermal contact only. Inhalation pathway could not be included because no inhalation toxicity value was available.																			
indicates that although chemical is a volatile the inhalation pathway could not be quantified, therefore, the SRV will underestimate the risk.																			
c Risk is based only on inhalation, the ingestion and dermal pathways could not be included because an oral toxicity value was not available.																			
(1) Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ /SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR/SRV). Individual chemical specific HQ should not exceed 0.2 (except for explosives), cumulative HI should not exceed 1 for each target endpoint. Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).																			
(2) ADREN - adrenal; CV/BLD - cardiovascular/blood system; CNS/PNS - central/peripheral nervous system; EYE - immune system; KIDN - kidney; LIV/GI - liver/gastrointestinal system; REPRO - reproductive system (incl. teratogenic/developmental effects); RESP - respiratory system; SKIN - skin irritation or other effects; SPLEEN; WHOLE BODY - increased mortality, decreased growth rate, etc.																			
Cancer Class:	Class A - Known human carcinogen																		
	Class B - Probable human carcinogen (B1 - limited evidence in humans; B2 - inadequate evidence in humans but adequate in animals)																		
	Class C - Possible human carcinogen																		
	Group D - Not Classifiable																		

APPENDIX G.2

MAJOR INFREQUENT CONSTRUCTION WORKER SPREADSHEETS

Major Construction/Utility Worker

Short-term Major Construction/Utility Worker - Subchronic Ingestion of chemicals in soil.

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Value Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration (mg/kg)	Cs (back-calculated)		
IR	Ingestion Rate (mg soil/day)	480	C	EPA default for workers involved in construction activities
CF	Conversion Factor (kg/mg)	1.00E-06		
FI	Fraction ingested from contaminated area	1.00	NA	
EF	Exposure Frequency (# days during exposure period)	78	NA	6 d/wk for 3 month period
BW	Body weight (kg)	70	C	EPA 1989b
AT	Averaging Time (days)	91		3 month period
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

U = Upper Bound Value

Major Construction/Utility Worker

Short-term Major Construction/Utility Worker - Subchronic Dermal contact with chemicals in soil.

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
CF	Conversion Factor (kg/mg)	1.00E-06		
SA	Skin surface area potentially in contact with dust/soil (cm2)	4900	C	25% of ave total body surface area (19400 cm2) (equivalent to hands, arms and part of head)
AF	Skin Adherence factor (mg/cm2)	0.3	C	Outdoor worker (Kissel et al., as cited in EPA 1995 Draft and EPA 1992)
ABS	Absorption factor	Chemical Specific		
EF	Exposure Frequency (# days during exposure period)	78	NA	6 d/wk for 3 month period
BW	Body Weight (kg)	70	C	
AT	Averaging time (days)	91		3 month period
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

U = Upper Bound Value

M = between Central Tendency and Upper Bound Values

Calculation of Volatilization Factor (VF)

$$VF \text{ (m3/kg)} = (Q/C) \times [(3.14 \times Da \times T)^{0.5} / (2 \times B \times Da)] \times 10^{-4} \text{ m2/cm2}$$

Variable	Definition	Variable Utilized	Rationale/Reference
VF	Volatilization Factor (m3/kg)	back-calculated	
(Q/C)	Inverse of the mean concentration at the center of a source (g/m2-s per kg/m3) (use site-specific area if available)	46	EPA Technical Background Document for SSIs (1996) Approx. 90th percentile for annual averages - - used in combination with only warmer months of the year.
Da	Apparent Diffusivity (cm2/s) = $[(Pa^{10/3} \times Di \times H') + (Pw^{10/3} \times Dw)] / Pt^{1/2} / (B \times Kd + Pw + Pa \times H')$	Chemical Specific	EPA Region IX PRG table
Pw	Water filled soil porosity = $(Om \times B)$	0.15	Calculated
Pa	Air filled soil porosity = $Pt - Pw$	0.28	Calculated
Pt	Total soil porosity = $1 - (B/Ps)$	0.43	Calculated
Om	Soil moisture content (cm3-water/g-soil)	0.1	Default, use site specific if available.
B	Dry soil bulk density (g/cm3)	1.5	EPA Technical Background Document for SSIs (1996)
Ps	soil particle density (g/cm3)	2.65	EPA Technical Background Document for SSIs (1996)
Di	Diffusivity in air (cm2/s)	Chemical Specific	EPA Region IX PRG table
Dw	Diffusivity in water (cm2/s)	Chemical Specific	EPA Region IX PRG table
H	Henry's constant (atm - m3/mol)	Chemical Specific	EPA Region IX PRG table
H'	dimensionless Henry's constant = $H \times 41$	Chemical Specific	Calculated
Kd	Soil-water partition coefficient (cm3/g) = $Koc \times Oc$	Chemical Specific	Calculated
Koc	Organic carbon partition coefficient (cm3/g)	Chemical Specific	EPA Region IX PRG table
Oc	Organic carbon content of soil	0.005	Default, use site specific if available.
T	Exposure interval (s)	7.86E+06	Assumes 3 month exposure period

NOTE:

Major Construction/Utility Worker

Short-term Major Construction/Utility Worker - Subchronic Air Concentration Estimation

Noncancer Evaluation: $\text{Air Conc (mg/m}^3\text{)} = [\text{Cs} \times (1/\text{VF} + 1/\text{PEF}) \times \text{EF}]/\text{AT}$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
1/VF	Inverse of the volatilization factor (kg/m ³)	Chemical specific calculation		EPA Methodology
1/PEF	Inverse of the particulate emission factor (kg/m ³)	4.00E-08	NA	Assume construction conditions (activity occurring on bare excavated soil, etc.)
EF	Exposure Frequency (# days during exposure period)	78		6 d/wk for 3 month period
AT	Averaging time (days)	91		3 month period

NA = Not available

C = Central Tendency Value

M = between Central Tendency and Upper Bound Values

U = Upper Bound Value

Major Construction/Utility Worker

Calculation of soil saturation limit (volatilization model is only applicable if Cs is < Csat)

$$C_{sat} \text{ (mg/kg)} = (S/B) \times [(K_d \times B) + P_w + (H' \times P_a)]$$

Variable	Definition	Variable Utilized	Rationale/Reference
Csat	Soil Saturation Concentration (mg/kg)	Csat back-calculated	
Kd	Soil water partition coefficient (l/kg) = Koc x OC	Site-Specific	
Koc	Organic carbon partition coefficient (l/kg)	Chemical Specific	
OC	Organic carbon content of soil	0.005	
S	Solubility in water (mg/l)	Chemical Specific	
B	Soil bulk density (kg/l)	1.5	EPA default (EPA 1993)
Pw	Water filled soil porosity (unitless) =Pt - Pa	0.15	
Pt	Total soil porosity (unitless) =1- B/Ps	0.43	
Ps	True soil density or particulate density (kg/l)	2.65	EPA default (EPA 1993)
Pa	Air-filled soil porosity (unitless) = Pt - O	0.28	EPA default (EPA 1993)
O	Average unsaturated zone soil gravimetric water content (L water/L soil) =Om x B/Dw	0.15	
Om	Average unsaturated zone soil gravimetric water content (kg water/kg soil)	0.1	
Dw	Density of water (kg water/L water)	1	
H	Henry's constant (atm - m3/mol)	Chemical Specific	
H'	Modified Henry's constant (atm-m3/mol) =41 x H	Chemical Specific	

Csat for each contaminant is the concentration at which the adsorptive limit of the soil plus the theoretical dissolution limit of the contaminant in the available soil moisture has been reached. Concentrations > Csat indicates "free phase" contaminants within the soil matrix. The equation presented here is a modification of the equation presented in Part B RAGS guidance. The above equation takes into account the amount of contaminant that is in vapor phase in the pore spaces of the soil.

Major Construction/Utility Worker

$$VF \text{ (m3/kg)} = (Q/C) \times [(3.14 \times Da \times T)^{0.5} / (2 \times B \times Da)] \times 10^{-4} \text{ m2/cm2}$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Inorganics							
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium III							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury (inorganic)	3.07E-02	6.30E-06	1.46E-05		5.20E+01	1.14E-02	1.99E+03
Nickel							
Potassium							
Selenium							
Sodium							
Thallium							
Vanadium							
Zinc							
Organics							
Acetone	1.00E-01	1.10E-05	4.19E-05	2.20E+00	1.10E-02	2.10E-05	1.18E+03
Benzene	8.80E-02	9.80E-06	2.26E-03	6.50E+01	3.25E-01	5.50E-03	1.60E+02
Bromomethane (methyl bro	1.00E-01	1.20E-05	1.70E-03	1.30E+02	6.50E-01	6.20E-03	1.85E+02

Major Construction/Utility Worker

$$VF \text{ (m3/kg)} = (Q/C) \times [(3.14 \times Da \times T)^{0.5} / (2 \times B \times Da)] \times 10^{-4} \text{ m2/cm2}$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Butyl benzylphthalate							
Carbazole							
Carbon Disulfide	1.10E-01	1.00E-05	6.23E-03	5.40E+01	2.70E-01	1.20E-02	9.66E+01
Chlorobenzene	7.20E-02	6.80E-06	3.27E-04	3.30E+02	1.65E+00	3.70E-03	4.21E+02
4-Chloro-3-methylphenol							
Dibenzofuran (unsubstituted)				7.80E+03	3.90E+01	1.30E-05	#DIV/0!
Dibutyl phthalate							
1,1 - Dichloroethane	9.10E-02	1.10E-05	3.02E-03	3.00E+01	1.50E-01	4.30E-03	1.39E+02
1,2 - Dichloroethylene (mix	7.90E-02	1.10E-05	2.55E-03	5.90E+01	2.95E-01	6.60E-03	1.51E+02
Dichloromethane (methylen	1.00E-01	1.17E-05	3.46E-03	8.80E+00	4.40E-02	2.60E-03	1.30E+02
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)							
Di - n - octyl phthalate	1.51E-02	3.58E-06	5.57E-12	8.00E+07	4.00E+05	6.68E-05	3.23E+06
Ethyl benzene	7.90E-02	7.80E-06	1.08E-03	2.20E+02	1.10E+00	7.90E-03	2.32E+02
Methyl ethyl ketone (2-buta	9.00E-02	9.80E-06	4.38E-05	4.50E+00	2.25E-02	2.70E-05	1.15E+03
Methyl butyl ketone (MBK)(2-hexanone)							
Methyl isobutyl ketone (MI	7.50E-02	7.80E-06	3.06E-05	1.30E+02	6.50E-01	1.40E-04	1.38E+03
PAHs (Polynuclear Aromatic Hydrocarbons)				0.00E+00	0.00E+00	0.00E+00	#DIV/0!
Acenaphthene	6.40E-02	7.70E-06	7.26E-06	4.60E+03	2.30E+01	1.20E-03	2.83E+03
Acenaphthylene	4.39E-02	7.07E-06	3.13E-07	7.00E+03	3.50E+01	1.14E-04	1.36E+04
Anthracene	5.80E-02	7.70E-06	6.69E-08	1.30E+04	6.50E+01	3.40E-05	2.95E+04
Benz[a]anthracene							
Benzo[b]fluoranthene							
Benzo(g,h,i)perylene							
Benzo[k]fluoranthene							
Benzo(a)pyrene							
Chrysene							
Dibenz[ah]anthracene							
Fluoranthene							
Fluorene	6.10E-02	7.90E-06	2.60E-07	7.90E+03	3.95E+01	7.70E-05	1.49E+04

Major Construction/Utility Worker

$$VF \text{ (m3/kg)} = (Q/C) \times [(3.14 \times Da \times T)^{0.5} / (2 \times B \times Da)] \times 10^{-4} \text{ m2/cm2}$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Indeno[1,2,3-cd]pyrene							
2-Methylnaphthalene							
Naphthalene	6.90E-02	7.50E-06	2.96E-05	1.30E+03	6.50E+00	1.30E-03	1.40E+03
Phenanthrene							
Pyrene	2.70E-02	7.20E-06	1.06E-09	1.20E+05	6.00E+02	1.00E-05	2.34E+05
PCBs (Polychlorinated Biphenyls)							
Pentachlorophenol							
Phenol							
Styrene	7.10E-02	8.00E-06	1.86E-04	3.60E+02	1.80E+00	2.30E-03	5.59E+02
Tetrachloroethylene (PCE)	7.20E-02	8.20E-06	1.01E-03	6.60E+02	3.30E+00	2.30E-02	2.40E+02
Toluene	7.80E-02	8.60E-06	7.75E-04	2.60E+02	1.30E+00	6.60E-03	2.74E+02
1,1,1 - Trichloroethane	8.00E-02	8.80E-06	5.61E-04	1.50E+02	7.50E-01	2.80E-03	3.22E+02
Trichloroethylene (TCE)	8.10E-02	9.10E-06	1.92E-03	1.30E+02	6.50E-01	8.90E-03	1.74E+02
Xylenes (mixed)	7.20E-02	8.40E-06	6.22E-04	2.40E+02	1.20E+00	5.30E-03	3.06E+02

Major Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/B) \times [(K_d \times B) + P_w + (H' \times P_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Inorganics				
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium				
Cadmium				
Calcium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Iron				
Lead				
Magnesium				
Manganese				
Mercury (inorganic)				
Nickel				
Potassium				
Selenium				
Sodium				
Thallium				
Vanadium				
Zinc				
Organics				
Acetone	2.20E+00	1.00E+06	2.10E-05	111163
Benzene	6.50E+01	1.80E+03	5.50E-03	842
Bromomethane (methyl bro	1.30E+02	1.80E+04	6.20E-03	14366

$$C_{sat} \text{ (mg/kg)} = (S/B) \times [(K_d \times B) + P_w + (H' \times P_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ / mol)	C _{sat} (mg/kg)
Butyl benzylphthalate				
Carbazole				
Carbon Disulfide	5.40E+01	2.90E+03	1.20E-02	1343
Chlorobenzene	3.30E+02	4.70E+02	3.70E-03	836
4-Chloro-3-methylphenol				
Dibenzofuran (unsubstitute	7.80E+03	3.10E+00	1.30E-05	121
Dibutyl phthalate				
1,1 - Dichloroethane	3.00E+01	5.50E+03	4.30E-03	1559
1,2 - Dichloroethylene (mix	5.90E+01	6.30E+03	6.60E-03	2811
Dichloromethane (methylen	8.80E+00	1.32E+04	2.60E-03	2167
Di(2 - ethylhexyl)phthalate (0.00E+00	0.00E+00	0.00E+00	0
Di - n - octyl phthalate	8.00E+07	2.00E-02	6.68E-05	8000
Ethyl benzene	2.20E+02	1.50E+02	7.90E-03	189
Methyl ethyl ketone (2-buta	4.50E+00	2.70E+05	2.70E-05	33132
Methyl butyl ketone (MBK)(2-hexanone)				
Methyl isobutyl ketone (MI	1.30E+02	1.90E+04	1.40E-04	14271
PAHs (Polynuclear Aromatic Hydrocarbons)				
Acenaphthene	4.60E+03	3.90E+00	1.20E-03	90
Acenaphthylene	7.00E+03	3.93E+00	1.14E-04	138
Anthracene	1.30E+04	7.50E-02	3.40E-05	5
Benz[a]anthracene				
Benzo[b]fluoranthene				
Benzo(g,h,i)perylene				
Benzo[k]fluoranthene				
Benzo(a)pyrene				
Chrysene				
Dibenz[ah]anthracene				
Fluoranthene				
Fluorene	7.90E+03	9.00E+01	7.70E-05	3564

Major Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/B) \times [(K_d \times B) + P_w + (H' \times P_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Indeno[1,2,3-cd]pyrene				
2-Methylnaphthalene				
Naphthalene	1.30E+03	2.40E+02	1.30E-03	1586
Phenanthrene				
Pyrene	1.20E+05	1.00E+02	1.00E-05	60010
PCBs (Polychlorinated Biphenyls)				
Pentachlorophenol				
Phenol				
Styrene	3.60E+02	6.80E+02	2.30E-03	1304
Tetrachloroethylene (PCE)	6.60E+02	1.50E+02	2.30E-02	537
Toluene	2.60E+02	8.80E+02	6.60E-03	1277
1,1,1 - Trichloroethane	1.50E+02	9.80E+02	2.80E-03	854
Trichloroethylene (TCE)	1.30E+02	1.00E+03	8.90E-03	819
Xylenes (mixed)	2.40E+02	2.00E+02	5.30E-03	268

Major Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Table 1. Exposure Calculation for Subchronic Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Inorganics										
Aluminum	7830.000	480	1.00E-06	1.00	78	70	91	4.60E-02	25550	1.64E-04
Antimony	3.400	480	1.00E-06	1.00	78	70	91	2.00E-05	25550	7.12E-08
Arsenic	13.800	480	1.00E-06	1.00	78	70	91	8.11E-05	25550	2.89E-07
Barium	201.000	480	1.00E-06	1.00	78	70	91	1.18E-03	25550	4.21E-06
Beryllium	0.700	480	1.00E-06	1.00	78	70	91	4.11E-06	25550	1.47E-08
Cadmium	0.750	480	1.00E-06	1.00	78	70	91	4.41E-06	25550	1.57E-08
Calcium	46500.000	480	1.00E-06	1.00	78	70	91	2.73E-01	25550	9.73E-04
Chromium III	91.000	480	1.00E-06	1.00	78	70	91	5.35E-04	25550	1.90E-06
Chromium VI	618.000	480	1.00E-06	1.00	78	70	91	3.63E-03	25550	1.29E-05
Cobalt	11.400	480	1.00E-06	1.00	78	70	91	6.70E-05	25550	2.39E-07
Copper	1360.000	480	1.00E-06	1.00	78	70	91	7.99E-03	25550	2.85E-05
Iron	48400.000	480	1.00E-06	1.00	78	70	91	2.84E-01	25550	1.01E-03
Lead	733.000	480	1.00E-06	1.00	78	70	91	4.31E-03	25550	1.53E-05
Magnesium	20000.000	480	1.00E-06	1.00	78	70	91	1.18E-01	25550	4.19E-04
Manganese	2490.000	480	1.00E-06	1.00	78	70	91	1.46E-02	25550	5.21E-05
Mercury (inorganic)	0.320	480	1.00E-06	1.00	78	70	91	1.88E-06	25550	6.70E-09
Nickel	33.500	480	1.00E-06	1.00	78	70	91	1.97E-04	25550	7.01E-07
Potassium	1350.000	480	1.00E-06	1.00	78	70	91	7.93E-03	25550	2.83E-05
Selenium	1.300	480	1.00E-06	1.00	78	70	91	7.64E-06	25550	2.72E-08
Sodium	487.000	480	1.00E-06	1.00	78	70	91	2.86E-03	25550	1.02E-05
Thallium	0.240	480	1.00E-06	1.00	78	70	91	1.41E-06	25550	5.02E-09
Vanadium	35.600	480	1.00E-06	1.00	78	70	91	2.09E-04	25550	7.45E-07
Zinc	479.000	480	1.00E-06	1.00	78	70	91	2.82E-03	25550	1.00E-05
Organics										
Acetone	1.700	480	1.00E-06	1.00	78	70	91	9.99E-06	25550	3.56E-08
Benzene	0.024	480	1.00E-06	1.00	78	70	91	1.41E-07	25550	5.02E-10
Bromomethane (methyl bromide)	0.002	480	1.00E-06	1.00	78	70	91	1.18E-08	25550	4.19E-11

Major Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Table 1. Exposure Calculation for Subchronic Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Butyl benzylphthalate	3.600	480	1.00E-06	1.00	78	70	91	2.12E-05	25550	7.54E-08
Carbazole	0.530	480	1.00E-06	1.00	78	70	91	3.12E-06	25550	1.11E-08
Carbon Disulfide	0.014	480	1.00E-06	1.00	78	70	91	8.23E-08	25550	2.93E-10
Chlorobenzene		480	1.00E-06	1.00	78	70	91	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11.000	480	1.00E-06	1.00	78	70	91	6.47E-05	25550	2.30E-07
Dibenzofuran (unsubstituted)	0.250	480	1.00E-06	1.00	78	70	91	1.47E-06	25550	5.23E-09
Dibutyl phthalate	0.140	480	1.00E-06	1.00	78	70	91	8.23E-07	25550	2.93E-09
1,1 - Dichloroethane	0.011	480	1.00E-06	1.00	78	70	91	6.47E-08	25550	2.30E-10
1,2 - Dichloroethylene (mixed isomers)	15.000	480	1.00E-06	1.00	78	70	91	8.82E-05	25550	3.14E-07
Dichloromethane (methylene chloride)		480	1.00E-06	1.00	78	70	91	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	4.400	480	1.00E-06	1.00	78	70	91	2.59E-05	25550	9.21E-08
Di - n - octyl phthalate	0.084	480	1.00E-06	1.00	78	70	91	4.94E-07	25550	1.76E-09
Ethyl benzene	0.720	480	1.00E-06	1.00	78	70	91	4.23E-06	25550	1.51E-08
Methyl ethyl ketone (2-butanone)	0.210	480	1.00E-06	1.00	78	70	91	1.23E-06	25550	4.40E-09
Methyl butyl ketone (MBK)(2-hexanon	0.026	480	1.00E-06	1.00	78	70	91	1.53E-07	25550	5.44E-10
Methyl isobutyl ketone (MIBK)(4-meth	0.150	480	1.00E-06	1.00	78	70	91	8.82E-07	25550	3.14E-09
PAHs (Polynuclear Aromatic Hydrocarbons)										
Acenaphthene	0.650	480	1.00E-06	1.00	78	70	91	3.82E-06	25550	1.36E-08
Acenaphthylene	0.760	480	1.00E-06	1.00	78	70	91	4.47E-06	25550	1.59E-08
Anthracene	0.640	480	1.00E-06	1.00	78	70	91	3.76E-06	25550	1.34E-08
Benz[a]anthracene	3.500	480	1.00E-06	1.00	78	70	91	2.06E-05	25550	7.33E-08
Benzo[b]fluoranthene	3.600	480	1.00E-06	1.00	78	70	91	2.12E-05	25550	7.54E-08
Benzo(g,h,i)perylene	0.820	480	1.00E-06	1.00	78	70	91	4.82E-06	25550	1.72E-08
Benzo[k]fluoranthene	1.300	480	1.00E-06	1.00	78	70	91	7.64E-06	25550	2.72E-08
Benzo(a)pyrene	1.700	480	1.00E-06	1.00	78	70	91	9.99E-06	25550	3.56E-08
Chrysene	1.700	480	1.00E-06	1.00	78	70	91	9.99E-06	25550	3.56E-08
Dibenz[ah]anthracene	0.400	480	1.00E-06	1.00	78	70	91	2.35E-06	25550	8.37E-09
Fluoranthene	5.600	480	1.00E-06	1.00	78	70	91	3.29E-05	25550	1.17E-07
Fluorene	0.760	480	1.00E-06	1.00	78	70	91	4.47E-06	25550	1.59E-08

Major Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Table 1. Exposure Calculation for Subchronic Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Indeno[1,2,3-cd]pyrene	1.100	480	1.00E-06	1.00	78	70	91	6.47E-06	25550	2.30E-08
2-Methylnaphthalene	1.000	480	1.00E-06	1.00	78	70	91	5.88E-06	25550	2.09E-08
Naphthalene	2.300	480	1.00E-06	1.00	78	70	91	1.35E-05	25550	4.81E-08
Phenanthrene	5.000	480	1.00E-06	1.00	78	70	91	2.94E-05	25550	1.05E-07
Pyrene	4.800	480	1.00E-06	1.00	78	70	91	2.82E-05	25550	1.00E-07
PCBs (Polychlorinated Biphenyls)	0.440	480	1.00E-06	1.00	78	70	91	2.59E-06	25550	9.21E-09
Pentachlorophenol	0.050	480	1.00E-06	1.00	78	70	91	2.94E-07	25550	1.05E-09
Phenol	0.120	480	1.00E-06	1.00	78	70	91	7.05E-07	25550	2.51E-09
Styrene	0.054	480	1.00E-06	1.00	78	70	91	3.17E-07	25550	1.13E-09
Tetrachloroethylene (PCE)	0.760	480	1.00E-06	1.00	78	70	91	4.47E-06	25550	1.59E-08
Toluene	1.000	480	1.00E-06	1.00	78	70	91	5.88E-06	25550	2.09E-08
1,1,1 - Trichloroethane	0.056	480	1.00E-06	1.00	78	70	91	3.29E-07	25550	1.17E-09
Trichloroethylene (TCE)	1.100	480	1.00E-06	1.00	78	70	91	6.47E-06	25550	2.30E-08
Xylenes (mixed)	7.300	480	1.00E-06	1.00	78	70	91	4.29E-05	25550	1.53E-07

Major Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{SAXCF} \times \text{AF} \times \text{ABS} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Worker Table 2. Exposure Calculation for Subchronic Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm ²)	CF (kg/mg)	AF (mg/cm ²)	ABS	EF (day/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Inorganics											
Aluminum	7830.00	4900	1.00E-06	0.30	0.001	78	70	91	1.41E-04	25550	5.02E-07
Antimony	3.40	4900	1.00E-06	0.30	0.001	78	70	91	6.12E-08	25550	2.18E-10
Arsenic	13.80	4900	1.00E-06	0.30	0.030	78	70	91	7.45E-06	25550	2.65E-08
Barium	201.00	4900	1.00E-06	0.30	0.001	78	70	91	3.62E-06	25550	1.29E-08
Beryllium	0.70	4900	1.00E-06	0.30	0.001	78	70	91	1.26E-08	25550	4.49E-11
Cadmium	0.75	4900	1.00E-06	0.30	0.010	78	70	91	1.35E-07	25550	4.81E-10
Calcium	46500.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Chromium III	91.00	4900	1.00E-06	0.30	0.010	78	70	91	1.64E-05	25550	5.83E-08
Chromium VI	618.00	4900	1.00E-06	0.30	0.010	78	70	91	1.11E-04	25550	3.96E-07
Cobalt	11.40	4900	1.00E-06	0.30	0.010	78	70	91	2.05E-06	25550	7.31E-09
Copper	1360.00	4900	1.00E-06	0.30	0.010	78	70	91	2.45E-04	25550	8.72E-07
Iron	48400.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Lead	733.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Magnesium	20000.00	4900	1.00E-06	0.30	0.000	78	70	91	0.00E+00	25550	0.00E+00
Manganese	2490.00	4900	1.00E-06	0.30	0.001	78	70	91	4.48E-05	25550	1.60E-07
Mercury (inorganic)	0.32	4900	1.00E-06	0.30	0.050	78	70	91	2.88E-07	25550	1.03E-09
Nickel	33.50	4900	1.00E-06	0.30	0.010	78	70	91	6.03E-06	25550	2.15E-08
Potassium	1350.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Selenium	1.30	4900	1.00E-06	0.30	0.010	78	70	91	2.34E-07	25550	8.33E-10
Sodium	487.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Thallium	0.24	4900	1.00E-06	0.30	0.010	78	70	91	4.32E-08	25550	1.54E-10
Vanadium	35.60	4900	1.00E-06	0.30	0.010	78	70	91	6.41E-06	25550	2.28E-08
Zinc	479.00	4900	1.00E-06	0.30	0.010	78	70	91	8.62E-05	25550	3.07E-07
Organics											
Acetone	1.70	4900	1.00E-06	0.30	0.100	78	70	91	3.06E-06	25550	1.09E-08
Benzene	0.02	4900	1.00E-06	0.30	0.010	78	70	91	4.32E-09	25550	1.54E-11
Bromomethane (methyl bromide)	0.00	4900	1.00E-06	0.30	0.050	78	70	91	1.80E-09	25550	6.41E-12
Butyl benzylphthalate	3.60	4900	1.00E-06	0.30	0.100	78	70	91	6.48E-06	25550	2.31E-08

Major Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{SAXCF} \times \text{AF} \times \text{ABS} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Worker Table 2. Exposure Calculation for Subchronic Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm ²)	CF (kg/mg)	AF (mg/cm ²)	ABS	EF (day/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Carbazole	0.53	4900	1.00E-06	0.30	0.100	78	70	91	9.54E-07	25550	3.40E-09
Carbon Disulfide	0.01	4900	1.00E-06	0.30	0.050	78	70	91	1.26E-08	25550	4.49E-11
Chlorobenzene	0.00	4900	1.00E-06	0.30	0.050	78	70	91	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Dibenzofuran (unsubstituted)	0.25	4900	1.00E-06	0.30	0.100	78	70	91	4.50E-07	25550	1.60E-09
Dibutyl phthalate	0.14	4900	1.00E-06	0.30	0.100	78	70	91	2.52E-07	25550	8.98E-10
1,1 - Dichloroethane	0.01	4900	1.00E-06	0.30	0.050	78	70	91	9.90E-09	25550	3.53E-11
1,2 - Dichloroethylene (mixed isomers)	15.00	4900	1.00E-06	0.30	0.050	78	70	91	1.35E-05	25550	4.81E-08
Dichloromethane (methylene chloride)	0.00	4900	1.00E-06	0.30	0.050	78	70	91	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	4.40	4900	1.00E-06	0.30	0.050	78	70	91	3.96E-06	25550	1.41E-08
Di - n - octyl phthalate	0.08	4900	1.00E-06	0.30	0.100	78	70	91	1.51E-07	25550	5.39E-10
Ethyl benzene	0.72	4900	1.00E-06	0.30	0.050	78	70	91	6.48E-07	25550	2.31E-09
Methyl ethyl ketone (2-butanone)	0.21	4900	1.00E-06	0.30	0.100	78	70	91	3.78E-07	25550	1.35E-09
Methyl butyl ketone (MBK)(2-hexanone	0.03	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Methyl isobutyl ketone (MIBK)(4-methy	0.15	4900	1.00E-06	0.30	0.050	78	70	91	1.35E-07	25550	4.81E-10
PAHs (Polynuclear Aromatic Hydrocarbons)											
Acenaphthene	0.65	4900	1.00E-06	0.30	0.050	78	70	91	5.85E-07	25550	2.08E-09
Acenaphthylene	0.76	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Anthracene	0.64	4900	1.00E-06	0.30	0.100	78	70	91	1.15E-06	25550	4.10E-09
Benz[a]anthracene	3.50	4900	1.00E-06	0.30	0.130	78	70	91	8.19E-06	25550	2.92E-08
Benzo[b]fluoranthene	3.60	4900	1.00E-06	0.30	0.130	78	70	91	8.42E-06	25550	3.00E-08
Benzo(g,h,i)perylene	0.82	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Benzo[k]fluoranthene	1.30	4900	1.00E-06	0.30	0.130	78	70	91	3.04E-06	25550	1.08E-08
Benzo(a)pyrene	1.70	4900	1.00E-06	0.30	0.130	78	70	91	3.98E-06	25550	1.42E-08
Chrysene	1.70	4900	1.00E-06	0.30	0.130	78	70	91	3.98E-06	25550	1.42E-08
Dibenz[ah]anthracene	0.40	4900	1.00E-06	0.30	0.130	78	70	91	9.36E-07	25550	3.33E-09
Fluoranthene	5.60	4900	1.00E-06	0.30	0.130	78	70	91	1.31E-05	25550	4.67E-08
Fluorene	0.76	4900	1.00E-06	0.30	0.100	78	70	91	1.37E-06	25550	4.87E-09
Indeno[1,2,3-cd]pyrene	1.10	4900	1.00E-06	0.30	0.130	78	70	91	2.57E-06	25550	9.17E-09
2-Methylnaphthalene	1.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA

Major Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{SAXCF} \times \text{AF} \times \text{ABS} \times \text{EF}) / (\text{BW} \times \text{AT})$$

Major Construction Worker Table 2. Exposure Calculation for Subchronic Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm ²)	CF (kg/mg)	AF (mg/cm ²)	ABS	EF (day/yr)	BW (kg)	AT (days)	Noncarcin Intake (mg/kg-d)	AT (days) (Carcin)	Carcin Intake (mg/kg-d)
Naphthalene	2.30	4900	1.00E-06	0.30	0.050	78	70	91	2.07E-06	25550	7.37E-09
Phenanthrene	5.00	4900	1.00E-06	0.30	NA	78	70	91	NA	25550	NA
Pyrene	4.80	4900	1.00E-06	0.30	0.100	78	70	91	8.64E-06	25550	3.08E-08
PCBs (Polychlorinated Biphenyls)	0.44	4900	1.00E-06	0.30	0.150	78	70	91	1.19E-06	25550	4.23E-09
Pentachlorophenol	0.05	4900	1.00E-06	0.30	0.250	78	70	91	2.25E-07	25550	8.01E-10
Phenol	0.12	4900	1.00E-06	0.30	0.800	78	70	91	1.73E-06	25550	6.15E-09
Styrene	0.05	4900	1.00E-06	0.30	0.050	78	70	91	4.86E-08	25550	1.73E-10
Tetrachloroethylene (PCE)	0.76	4900	1.00E-06	0.30	0.050	78	70	91	6.84E-07	25550	2.44E-09
Toluene	1.00	4900	1.00E-06	0.30	0.050	78	70	91	9.00E-07	25550	3.21E-09
1,1,1 - Trichloroethane	0.06	4900	1.00E-06	0.30	0.050	78	70	91	5.04E-08	25550	1.80E-10
Trichloroethylene (TCE)	1.10	4900	1.00E-06	0.30	0.050	78	70	91	9.90E-07	25550	3.53E-09
Xylenes (mixed)	7.30	4900	1.00E-06	0.30	0.050	78	70	91	6.57E-06	25550	2.34E-08

Major Construction/Utility Worker

Major Construction Worker 'Table 3. Calculation of subchronic average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	AT (days) (Noncar)	Noncarcin Air Conc (mg/m3)	AT (days) (Carcin)	Carcin Air Conc (ug/m3)
Inorganics								
Aluminum	7830.00		0.00000004	78	91	2.68E-04	25550	9.56E-04
Antimony	3.40		0.00000004	78	91	1.17E-07	25550	4.15E-07
Arsenic	13.80		0.00000004	78	91	4.73E-07	25550	1.69E-06
Barium	201.00		0.00000004	78	91	6.89E-06	25550	2.45E-05
Beryllium	0.70		0.00000004	78	91	2.40E-08	25550	8.55E-08
Cadmium	0.75		0.00000004	78	91	2.57E-08	25550	9.16E-08
Calcium	46500.00		0.00000004	78	91	1.59E-03	25550	5.68E-03
Chromium III	91.00		0.00000004	78	91	3.12E-06	25550	1.11E-05
Chromium VI	618.00		0.00000004	78	91	2.12E-05	25550	7.55E-05
Cobalt	11.40		0.00000004	78	91	3.91E-07	25550	1.39E-06
Copper	1360.00		0.00000004	78	91	4.66E-05	25550	1.66E-04
Iron	48400.00		0.00000004	78	91	1.66E-03	25550	5.91E-03
Lead	733.00		0.00000004	78	91	2.51E-05	25550	8.95E-05
Magnesium	20000.00		0.00000004	78	91	6.86E-04	25550	2.44E-03
Manganese	2490.00		0.00000004	78	91	8.54E-05	25550	3.04E-04
Mercury (inorganic)	0.32	5.02E-04	0.00000004	78	91	1.38E-04	25550	4.91E-04
Nickel	33.50		0.00000004	78	91	1.15E-06	25550	4.09E-06
Potassium	1350.00		0.00000004	78	91	4.63E-05	25550	1.65E-04
Selenium	1.30		0.00000004	78	91	4.46E-08	25550	1.59E-07
Sodium	487.00		0.00000004	78	91	1.67E-05	25550	5.95E-05
Thallium	0.24		0.00000004	78	91	8.23E-09	25550	2.93E-08
Vanadium	35.60		0.00000004	78	91	1.22E-06	25550	4.35E-06
Zinc	479.00		0.00000004	78	91	1.64E-05	25550	5.85E-05
Organics								
Acetone	1.70	8.50E-04	0.00000004	78	91	1.24E-03	25550	4.41E-03
Benzene	0.02	6.24E-03	0.00000004	78	91	1.28E-04	25550	4.57E-04
Bromomethane (methyl bromide)	0.00	5.41E-03	0.00000004	78	91	9.27E-06	25550	3.30E-05
Butyl benzylphthalate	3.60		0.00000004	78	91	1.23E-07	25550	4.40E-07
Carbazole	0.53		0.00000004	78	91	1.82E-08	25550	6.47E-08

Major Construction/Utility Worker

Major Construction Worker Table 3. Calculation of subchronic average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	AT (days) (Noncar)	Noncarcin Air Conc (mg/m3)	AT (days) (Carcin)	Carcin Air Conc (ug/m3)
Carbon Disulfide	0.01	1.04E-02	0.00000004	78	91	1.24E-04	25550	4.43E-04
Chlorobenzene	0.00	2.37E-03	0.00000004	78	91	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11.00		0.00000004	78	91	3.77E-07	25550	1.34E-06
Dibenzofuran (unsubstituted)	0.25		0.00000004	78	91	8.57E-09	25550	3.05E-08
Dibutyl phthalate	0.14		0.00000004	78	91	4.80E-09	25550	1.71E-08
1,1 - Dichloroethane	0.01	7.21E-03	0.00000004	78	91	6.80E-05	25550	2.42E-04
1,2 - Dichloroethylene (mixed isomers)	15.00	6.63E-03	0.00000004	78	91	8.53E-02	25550	3.04E-01
Dichloromethane (methylene chloride)	0.00	7.72E-03	0.00000004	78	91	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	4.40		0.00000004	78	91	1.51E-07	25550	5.37E-07
Di - n - octyl phthalate	0.08	3.10E-07	0.00000004	78	91	2.52E-08	25550	8.97E-08
Ethyl benzene	0.72	4.32E-03	0.00000004	78	91	2.66E-03	25550	9.49E-03
Methyl ethyl ketone (2-butanone)	0.21	8.68E-04	0.00000004	78	91	1.56E-04	25550	5.57E-04
Methyl butyl ketone (MBK)(2-hexanon	0.03		0.00000004	78	91	8.91E-10	25550	3.17E-09
Methyl isobutyl ketone (MIBK)(4-meth	0.15	7.26E-04	0.00000004	78	91	9.34E-05	25550	3.33E-04
PAHs (Polynuclear Aromatic Hydrocarbons)								
Acenaphthene	0.65	3.54E-04	0.00000004	78	91	1.97E-04	25550	7.02E-04
Acenaphthylene	0.76	7.34E-05	0.00000004	78	91	4.78E-05	25550	1.70E-04
Anthracene	0.64	3.40E-05	0.00000004	78	91	1.86E-05	25550	6.64E-05
Benz[a]anthracene	3.50		0.00000004	78	91	1.20E-07	25550	4.27E-07
Benzo[b]fluoranthene	3.60		0.00000004	78	91	1.23E-07	25550	4.40E-07
Benzo(g,h,i)perylene	0.82		0.00000004	78	91	2.81E-08	25550	1.00E-07
Benzo[k]fluoranthene	1.30		0.00000004	78	91	4.46E-08	25550	1.59E-07
Benzo(a)pyrene	1.70		0.00000004	78	91	5.83E-08	25550	2.08E-07
Chrysene	1.70		0.00000004	78	91	5.83E-08	25550	2.08E-07
Dibenz[ah]anthracene	0.40		0.00000004	78	91	1.37E-08	25550	4.88E-08
Fluoranthene	5.60		0.00000004	78	91	1.92E-07	25550	6.84E-07
Fluorene	0.76	6.70E-05	0.00000004	78	91	4.37E-05	25550	1.55E-04
Indeno[1,2,3-cd]pyrene	1.10		0.00000004	78	91	3.77E-08	25550	1.34E-07
2-Methylnaphthalene	1.00		0.00000004	78	91	3.43E-08	25550	1.22E-07
Naphthalene	2.30	7.15E-04	0.00000004	78	91	1.41E-03	25550	5.02E-03
Phenanthrene	5.00		0.00000004	78	91	1.71E-07	25550	6.11E-07

Major Construction/Utility Worker

Major Construction Worker Table 3. Calculation of subchronic average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	AT (days) (Noncar)	Noncarcin Air Conc (mg/m3)	AT (days) (Carcin)	Carcin Air Conc (ug/m3)
Pyrene	4.80	4.27E-06	0.00000004	78	91	1.77E-05	25550	6.32E-05
PCBs (Polychlorinated Biphenyls)	0.44		0.00000004	78	91	1.51E-08	25550	5.37E-08
Pentachlorophenol	0.05		0.00000004	78	91	1.71E-09	25550	6.11E-09
Phenol	0.12		0.00000004	78	91	4.11E-09	25550	1.47E-08
Styrene	0.05	1.79E-03	0.00000004	78	91	8.29E-05	25550	2.95E-04
Tetrachloroethylene (PCE)	0.76	4.17E-03	0.00000004	78	91	2.72E-03	25550	9.68E-03
Toluene	1.00	3.65E-03	0.00000004	78	91	3.13E-03	25550	1.12E-02
1,1,1 - Trichloroethane	0.06	3.11E-03	0.00000004	78	91	1.49E-04	25550	5.32E-04
Trichloroethylene (TCE)	1.10	5.76E-03	0.00000004	78	91	5.43E-03	25550	1.93E-02
Xylenes (mixed)	7.30	3.27E-03	0.00000004	78	91	2.05E-02	25550	7.29E-02

Major Construction/Utility Worker

Major Construction Worker Table 4. Subchronic Noncancer Assessment

Chemical	Oral SubRfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation SubRfC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Inorganics														
Aluminum	1.00E+00	4.60E-02	1.00	0.046	77%	1.41E-04	0.01	0.014	23%	NA	2.68E-04			0.060
Antimony	4.00E-04	2.00E-05	1.00	0.050	93%	6.12E-08	0.05	0.003	6%	2.00E-04	1.17E-07	0.001	1%	0.054
Arsenic	3.00E-04	8.11E-05	1.00	0.270	91%	7.45E-06	0.90	0.028	9%	NA	4.73E-07			0.298
Barium	7.00E-02	1.18E-03	1.00	0.017	87%	3.62E-06	0.05	0.001	5%	5.00E-03	6.89E-06	0.001	7%	0.019
Beryllium	5.00E-03	4.11E-06	1.00	0.001	77%	1.26E-08	0.01	0.000	23%	NA	2.40E-08			0.001
Cadmium	1.00E-03	4.41E-06	1.00	0.004	94%	1.35E-07	1.00	0.000	3%	2.00E-04	2.57E-08	0.000	3%	0.005
Calcium	NA	2.73E-01	NA			NA	NA			NA	1.59E-03			
Chromium III	1.00E+00	5.35E-04	1.00	0.001	62%	1.64E-05	0.05	0.000	38%	NA	3.12E-06			0.001
Chromium VI	2.00E-02	3.63E-03	1.00	0.182	13%	1.11E-04	0.05	0.111	8%	2.00E-05	2.12E-05	1.059	78%	1.352
Cobalt	6.00E-02	6.70E-05	1.00	0.001	8%	2.05E-06	0.50	0.000	0%	3.00E-05	3.91E-07	0.013	92%	0.014
Copper	3.70E-02	7.99E-03	1.00	0.216	95%	2.45E-04	0.60	0.011	5%	NA	4.66E-05			0.227
Iron	NA	2.84E-01	NA			NA	NA			NA	1.66E-03			
Lead	NA	4.31E-03	0.00			NA	0.00			NA	2.51E-05			
Magnesium	NA	1.18E-01	0.00			0.00E+00	0.00			NA	6.86E-04			
Manganese	1.40E-01	1.46E-02	1.00	0.105	94%	4.48E-05	0.05	0.006	6%	NA	8.54E-05			0.111
Mercury (inorganic)	3.00E-03	1.88E-06	1.00	0.001	0%	2.88E-07	0.20	0.000	0%	3.00E-04	1.38E-04	0.459	100%	0.460
Nickel	2.00E-02	1.97E-04	1.00	0.010	62%	6.03E-06	0.05	0.006	38%	NA	1.15E-06			0.018
Potassium	NA	7.93E-03	NA			NA	NA			NA	4.63E-05			
Selenium	5.00E-03	7.64E-06	1.00	0.002	97%	2.34E-07	0.90	0.000	3%	NA	4.46E-08			0.002
Sodium	NA	2.86E-03	NA			NA	NA			NA	1.67E-05			
Thallium	8.00E-04	1.41E-06	1.00	0.002	97%	4.32E-08	0.90	0.000	3%	NA	8.23E-09			0.002
Vanadium	7.00E-03	2.09E-04	1.00	0.030	77%	6.41E-06	0.10	0.009	23%	NA	1.22E-06			0.039
Zinc	3.00E-01	2.82E-03	1.00	0.009	91%	8.62E-05	0.30	0.001	9%	NA	1.64E-05			0.010
Organics														
Acetone	1.00E+00	9.99E-06	1.00	0.000	19%	3.06E-06	0.90	0.000	6%	3.10E+01	1.24E-03	0.000	75%	0.000
Benzene	NA	1.41E-07	1.00			4.32E-09	0.90			6.00E-02	1.28E-04	0.002	100%	0.002
Bromomethane (methyl bromide)	3.00E-03	1.18E-08	1.00	0.000	8%	1.80E-09	0.90	0.000	1%	2.00E-01	9.27E-06	0.000	91%	0.000
Butyl benzylphthalate	2.00E+00	2.12E-05	1.00	0.000	75%	6.48E-06	0.90	0.000	25%	NA	1.23E-07			0.000
Carbazole	NA	3.12E-06	1.00			9.54E-07	0.90			NA	1.82E-08			
Carbon Disulfide	1.00E-01	8.23E-08	1.00	0.000	0%	1.26E-08	0.90	0.000	0%	7.00E-01	1.24E-04	0.000	99%	0.000
Chlorobenzene	4.00E-01	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	2.00E-01	0.00E+00	0.000	#DIV/0!	0.000
4-Chloro-3-methylphenol	NA	6.47E-05	NA			NA	NA			NA	3.77E-07			
Dibenzofuran (unsubstituted)	4.00E-03	1.47E-06	1.00	0.000	75%	4.50E-07	0.90	0.000	25%	NA	8.57E-09			0.000
Dibutyl phthalate	1.00E+00	8.23E-07	1.00	0.000	75%	2.52E-07	0.90	0.000	25%	NA	4.80E-09			0.000
1,1 - Dichloroethane	1.00E+00	6.47E-08	1.00	0.000	0%	9.90E-09	0.90	0.000	0%	5.00E+00	6.80E-05	0.000	99%	0.000
1,2 - Dichloroethylene (mixed isomers)	9.00E-03	8.82E-05	1.00	0.010	8%	1.35E-05	0.90	0.002	1%	8.00E-01	8.53E-02	0.107	90%	0.118
Dichloromethane (methylene chloride)	6.00E-02	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	1.00E-01	0.00E+00	0.000	#DIV/0!	0.000
Di(2 - ethylhexyl)phthalate (bis-ethylhex)	2.00E-02	2.59E-05	1.00	0.001	82%	3.96E-06	0.70	0.000	18%	NA	1.51E-07			0.002

Major Construction/Utility Worker

Major Construction Worker Table 4. Subchronic Noncancer Assessment

Chemical	Oral SubRfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation SubRfC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Di - n - octyl phthalate	2.00E-02	4.94E-07	1.00	0.000	75%	1.51E-07	0.90	0.000	25%	NA	2.52E-08			0.000
Ethyl benzene	1.00E-01	4.23E-06	1.00	0.000	2%	6.48E-07	0.85	0.000	0%	1.30E+00	2.66E-03	0.002	98%	0.002
Methyl ethyl ketone (2-butanone)	2.00E+00	1.23E-06	1.00	0.000	0%	3.78E-07	0.90	0.000	0%	1.00E+00	1.56E-04	0.000	99%	0.000
Methyl butyl ketone (MBK)(2-hexanone)	NA	1.53E-07	NA			NA	NA			NA	8.91E-10			
Methyl isobutyl ketone (MIBK)(4-methyl	8.00E-01	8.82E-07	1.00	0.000	1%	1.35E-07	0.90	0.000	0%	8.00E-01	9.34E-05	0.000	99%	0.000
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	6.00E-01	3.82E-06	1.00	0.000	84%	5.85E-07	0.80	0.000	16%	NA	1.97E-04			0.000
Acenaphthylene	NA	4.47E-06	NA			NA	NA			NA	4.78E-05			
Anthracene	3.00E+00	3.76E-06	1.00	0.000	72%	1.15E-06	0.80	0.000	28%	NA	1.86E-05			0.000
Benz[a]anthracene	NA	2.06E-05	1.00			8.19E-06	0.80			NA	1.20E-07			
Benzo[b]fluoranthene	NA	2.12E-05	1.00			8.42E-06	0.80			NA	1.23E-07			
Benzo(g,h,i)perylene	NA	4.82E-06	NA			NA	NA			NA	2.81E-08			
Benzo[k]fluoranthene	NA	7.64E-06	1.00			3.04E-06	0.80			NA	4.46E-08			
Benzo(a)pyrene	NA	9.99E-06	1.00			3.98E-06	0.80			NA	5.83E-08			
Chrysene	NA	9.99E-06	1.00			3.98E-06	0.80			NA	5.83E-08			
Dibenz[ah]anthracene	NA	2.35E-06	1.00			9.36E-07	0.80			NA	1.37E-08			0.000
Fluoranthene	4.00E-01	3.29E-05	1.00	0.000	67%	1.31E-05	0.80	0.000	33%	NA	1.92E-07			0.000
Fluorene	4.00E-01	4.47E-06	1.00	0.000	72%	1.37E-06	0.80	0.000	28%	NA	4.37E-05			0.000
Indeno[1,2,3-cd]pyrene	NA	6.47E-06	1.00			2.57E-06	0.80			NA	3.77E-08			
2-Methylnaphthalene	NA	5.88E-06	NA			NA	NA			NA	3.43E-08			
Naphthalene	2.00E-02	1.35E-05	1.00	0.001	16%	2.07E-06	0.80	0.000	3%	4.00E-01	1.41E-03	0.004	81%	0.004
Phenanthrene	NA	2.94E-05	NA			NA	NA			NA	1.71E-07			
Pyrene	3.00E-01	2.82E-05	1.00	0.000	32%	8.64E-06	0.80	0.000	12%	1.10E-01	1.77E-05	0.000	55%	0.000
PCBs (Polychlorinated Biphenyls)	5.00E-05	2.59E-06	1.00	0.052	66%	1.19E-06	0.90	0.026	34%	NA	1.51E-08			0.078
Pentachlorophenol	3.00E-02	2.94E-07	1.00	0.000	37%	2.25E-07	0.90	0.000	31%	2.00E-04	1.71E-09	0.000	32%	0.000
Phenol	6.00E-01	7.05E-07	1.00	0.000	27%	1.73E-06	0.90	0.000	73%	NA	4.11E-09			0.000
Styrene	2.00E-01	3.17E-07	1.00	0.000	5%	4.86E-08	0.90	0.000	1%	3.00E+00	8.29E-05	0.000	94%	0.000
Tetrachloroethylene (PCE)	1.00E-01	4.47E-06	1.00	0.000	85%	6.84E-07	0.90	0.000	15%	4.00E-01	2.72E-03			0.000
Toluene	2.00E+00	5.88E-06	1.00	0.000	0%	9.00E-07	0.90	0.000	0%	1.00E+00	3.13E-03	0.003	100%	0.003
1,1,1 - Trichloroethane	3.50E-02	3.29E-07	1.00	0.000	19%	5.04E-08	0.90	0.000	3%	4.00E+00	1.49E-04	0.000	77%	0.000
Trichloroethylene (TCE)	2.00E-03	6.47E-06	1.00	0.003	22%	9.90E-07	0.90	0.001	4%	5.00E-01	5.43E-03	0.011	74%	0.015
Xylenes (mixed)	2.00E-01	4.29E-05	1.00	0.000	3%	6.57E-06	0.90	0.000	1%	3.00E+00	2.05E-02	0.007	96%	0.007

Subchronic toxicity values were not available for Al, Cd, Co, dibenzofuran, di(ethylhexyl)phthalate, ethylbenzene, styrene, pyrene, pentachlorophenol, tetrachloroethylene, and 1,1,1 trichloroethane.

Chronic toxicity values, if available, were utilized as surrogate values.

SCREENING HI =

2.904

Major Construction/Utility Worker

Major Construction Worker Table 5. Subchronic Cancer Assessment

Chemical	Oral CSF (mg/kg-d)-1	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Inorganics														
Aluminum	NA	1.64E-04	1.00			5.02E-07	0.01			NA	9.56E-04			
Antimony	NA	7.12E-08	1.00			2.18E-10	0.05			NA	4.15E-07			
Arsenic	1.50E+00	2.89E-07	1.00	4.33E-07	89%	2.65E-08	0.90	4.42E-08	9%	4.00E-03	1.69E-06	6.74E-09	1%	4.84E-07
Barium	NA	4.21E-06	1.00			1.29E-08	0.05			NA	2.45E-05			
Beryllium	NA	1.47E-08	1.00			4.49E-11	0.01			2.40E-03	8.55E-08	2.05E-10	100%	2.05E-10
Cadmium	NA	1.57E-08	1.00			4.81E-10	1.00			1.80E-03	9.16E-08	1.65E-10	100%	1.65E-10
Calcium	NA	9.73E-04	NA			NA	NA			NA	5.68E-03			
Chromium III	NA	1.90E-06	1.00			5.83E-08	0.05			NA	1.11E-05			
Chromium VI	NA	1.29E-05	1.00			3.96E-07	0.05			1.20E-02	7.55E-05	9.06E-07	100%	9.06E-07
Cobalt	NA	2.39E-07	1.00			7.31E-09	0.50			NA	1.39E-06			
Copper	NA	2.85E-05	1.00			8.72E-07	0.60			NA	1.66E-04			
Iron	NA	1.01E-03	NA			NA	NA			NA	5.91E-03			
Lead	NA	1.53E-05	0.00			NA	0.00			NA	8.95E-05			
Magnesium	NA	4.19E-04	0.00			0.00E+00	0.00			NA	2.44E-03			
Manganese	NA	5.21E-05	1.00			1.60E-07	0.05			NA	3.04E-04			
Mercury (inorganic)	NA	6.70E-09	1.00			1.03E-09	0.20			NA	4.91E-04			
Nickel	NA	7.01E-07	1.00			2.15E-08	0.05			4.80E-04	4.09E-06	1.96E-09	100%	1.96E-09
Potassium	NA	2.83E-05	NA			NA	NA			NA	1.65E-04			
Selenium	NA	2.72E-08	1.00			8.33E-10	0.90			NA	1.59E-07			
Sodium	NA	1.02E-05	NA			NA	NA			NA	5.95E-05			
Thallium	NA	5.02E-09	1.00			1.54E-10	0.90			NA	2.93E-08			
Vanadium	NA	7.45E-07	1.00			2.28E-08	0.10			NA	4.35E-06			
Zinc	NA	1.00E-05	1.00			3.07E-07	0.30			NA	5.85E-05			
Organics														
Acetone	NA	3.56E-08	1.00			1.09E-08	0.90			NA	4.41E-03			0.00E+00
Benzene	2.90E-02	5.02E-10	1.00	1.46E-11	0%	1.54E-11	0.90	4.96E-13	0%	8.30E-06	4.57E-04	3.80E-09	100%	3.81E-09
Bromomethane (methyl bromide)	NA	4.19E-11	1.00			6.41E-12	0.90			NA	3.30E-05			
Butyl benzylphthalate	NA	7.54E-08	1.00			2.31E-08	0.90			NA	4.40E-07			
Carbazole	2.00E-02	1.11E-08	1.00	2.22E-10	75%	3.40E-09	0.90	7.55E-11	25%	NA	6.47E-08			2.97E-10
Carbon Disulfide	NA	2.93E-10	1.00			4.49E-11	0.90			NA	4.43E-04			
Chlorobenzene	NA	0.00E+00	1.00			0.00E+00	0.90			NA	0.00E+00			
4-Chloro-3-methylphenol	NA	2.30E-07	NA			NA	NA			NA	1.34E-06			
Dibenzofuran (unsubstituted)	NA	5.23E-09	1.00			1.60E-09	0.90			NA	3.05E-08			
Dibutyl phthalate	NA	2.93E-09	1.00			8.98E-10	0.90			NA	1.71E-08			
1,1 - Dichloroethane	5.70E-03	2.30E-10	1.00	1.31E-12	0%	3.53E-11	0.90	2.23E-13	0%	1.60E-06	2.42E-04	3.87E-10	100%	3.89E-10
1,2 - Dichloroethylene (mixed isomers)	NA	3.14E-07	1.00			4.81E-08	0.90			NA	3.04E-01			
Dichloromethane (methylene chloride)	7.00E-03	0.00E+00	1.00	0.00E+00	#DIV/0!	0.00E+00	0.90	0.00E+00	#DIV/0!	4.70E-07	0.00E+00	0.00E+00	#DIV/0!	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhex)	1.40E-02	9.21E-08	1.00	1.29E-09	82%	1.41E-08	0.70	2.82E-10	18%	4.00E-06	5.37E-07	2.15E-12	0%	1.57E-09

Major Construction/Utility Worker

Major Construction Worker Table 5. Subchronic Cancer Assessment

Chemical	Oral CSF (mg/kg-d)-1	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Di - n - octyl phthalate	NA	1.76E-09	1.00			5.39E-10	0.90			NA	8.97E-08			
Ethyl benzene	NA	1.51E-08	1.00			2.31E-09	0.85			NA	9.49E-03			
Methyl ethyl ketone (2-butanone)	NA	4.40E-09	1.00			1.35E-09	0.90			NA	5.57E-04			
Methyl butyl ketone (MBK)(2-hexanone)	NA	5.44E-10	NA			NA	NA			NA	3.17E-09			
Methyl isobutyl ketone (MIBK)(4-methyl	NA	3.14E-09	1.00			4.81E-10	0.90			NA	3.33E-04			
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	NA	1.36E-08	1.00			2.08E-09	0.80			NA	7.02E-04			
Acenaphthylene	NA	1.59E-08	NA			NA	NA			NA	1.70E-04			
Anthracene	NA	1.34E-08	1.00			4.10E-09	0.80			NA	6.64E-05			
Benz[a]anthracene	7.30E-01	7.33E-08	1.00	5.35E-08	67%	2.92E-08	0.80	2.66E-08	33%	1.70E-04	4.27E-07	7.27E-11	0%	8.02E-08
Benzo[b]fluoranthene	7.30E-01	7.54E-08	1.00	5.50E-08	67%	3.00E-08	0.80	2.74E-08	33%	1.70E-04	4.40E-07	7.47E-11	0%	8.25E-08
Benzo(g,h,i)perylene	NA	1.72E-08	NA			NA	NA			NA	1.00E-07			
Benzo[k]fluoranthene	7.30E-02	2.72E-08	1.00	1.99E-09	67%	1.08E-08	0.80	9.89E-10	33%	1.70E-05	1.59E-07	2.70E-12	0%	2.98E-09
Benzo(a)pyrene	7.30E+00	3.56E-08	1.00	2.60E-07	67%	1.42E-08	0.80	1.29E-07	33%	1.70E-03	2.08E-07	3.53E-10	0%	3.89E-07
Chrysene	7.30E-03	3.56E-08	1.00	2.60E-10	67%	1.42E-08	0.80	1.29E-10	33%	1.70E-06	2.08E-07	3.53E-13	0%	3.89E-10
Dibenz[ah]anthracene	7.30E+00	8.37E-09	1.00	6.11E-08	67%	3.33E-09	0.80	3.04E-08	33%	1.70E-03	4.88E-08	8.30E-11	0%	9.16E-08
Fluoranthene	NA	1.17E-07	1.00			4.67E-08	0.80			NA	6.84E-07			
Fluorene	NA	1.59E-08	1.00			4.87E-09	0.80			NA	1.55E-04			
Indeno[1,2,3-cd]pyrene	7.30E-01	2.30E-08	1.00	1.68E-08	67%	9.17E-09	0.80	8.37E-09	33%	1.70E-04	1.34E-07	2.28E-11	0%	2.52E-08
2-Methylnaphthalene	NA	2.09E-08	NA			NA	NA			NA	1.22E-07			
Naphthalene	NA	4.81E-08	1.00			7.37E-09	0.80			NA	5.02E-03			
Phenanthrene	NA	1.05E-07	NA			NA	NA			NA	6.11E-07			
Pyrene	NA	1.00E-07	1.00			3.08E-08	0.80			NA	6.32E-05			
PCBs (Polychlorinated Biphenyls)	2.00E+00	9.21E-09	1.00	1.84E-08	66%	4.23E-09	0.90	9.40E-09	34%	2.20E-03	5.37E-08	1.18E-10	0%	2.79E-08
Pentachlorophenol	1.20E-01	1.05E-09	1.00	1.26E-10	54%	8.01E-10	0.90	1.07E-10	46%	3.40E-05	6.11E-09	2.08E-13	0%	2.33E-10
Phenol	NA	2.51E-09	1.00			6.15E-09	0.90			NA	1.47E-08			
Styrene	3.00E-02	1.13E-09	1.00	3.39E-11	16%	1.73E-10	0.90	5.77E-12	3%	5.70E-07	2.95E-04	1.68E-10	81%	2.08E-10
Tetrachloroethylene (PCE)	5.20E-02	1.59E-08	1.00	8.27E-10	54%	2.44E-09	0.90	1.41E-10	9%	5.80E-08	9.68E-03	5.62E-10	37%	1.53E-09
Toluene	NA	2.09E-08	1.00			3.21E-09	0.90			NA	1.12E-02			
1,1,1 - Trichloroethane	NA	1.17E-09	1.00			1.80E-10	0.90			NA	5.32E-04			
Trichloroethylene (TCE)	1.10E-02	2.30E-08	1.00	2.53E-10	1%	3.53E-09	0.90	4.31E-11	0%	1.70E-06	1.93E-02	3.29E-08	99%	3.32E-08
Xylenes (mixed)	NA	1.53E-07	1.00			2.34E-08	0.90			NA	7.29E-02			

ECR = Excess Cancer Risk

TOTAL ECR = 2.13E-06

APPENDIX G.3
MINOR FREQUENT CONSTRUCTION WORKER SPREADSHEETS

Minor Construction/Utility Worker

Minor Construction/Utility Worker - Chronic Ingestion of Soil Exposure

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Value Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration (mg/kg)	Cs (back-calculated)		
IR	Ingestion Rate (mg soil/day)	200	C	
CF	Conversion Factor (kg/mg)	1.00E-06		
FI	Fraction ingested from contaminated area	1.00	U	
EF	Exposure Frequency (day/yr)	80	C	Based on site specific information exposure
ED	Exposure duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
BW	Body weight (kg)	70	C	EPA 1989b
AT	Averaging Time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

U = Upper Bound Value

Minor Construction/Utility Worker

Minor Constsruction/Utility Worker - Chronic Dermal Contact with Soil Exposure

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
CF	Conversion Factor (kg/mg)	1.00E-06		
SA	Skin surface area potentially in contact with dust/soil (cm ²)	4900	C	25% of ave total body surface area (19400 cm ²) (equivalent to hands, arms and part of head)
AF	Skin Adherence factor (mg/cm ²)	0.3	C	Outdoor worker (Kissel et al., as cited in EPA 1995 Draf EPA 1992)
ABS	Absorption factor	Chemical Specific		
EF	Exposure Frequency (day/yr)	80	NA	Assume 5 d/wk for 5 mon/yr (e.g., May - Sept) minus precipitation days (1 d/wk)
ED	Exposure Duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
BW	Body Weight (kg)	70	C	
AT	Averaging time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

U = Upper Bound Value

M = between Central Tendency and Upper Bound Values

Minor Construction/Utility Worker

Minor Construction/Utility Worker - Calculation of Chronic Volatilization Factor (VF)

$$VF \text{ (m}^3\text{/kg)} = (Q/C) \times [(3.14 \times D_s \times T)^{1/2} / (2 \times \rho_b \times D_s)] \times 10^{-4} \text{ m}^2\text{/cm}^2$$

Variable	Definition	Variable Utilized	Rationale/Reference
VF	Volatilization Factor (m ³ /kg)	back-calculated	
(Q/C)	Inverse of the mean concentration at the center of a source (g/m ² -s per kg/m ³) (use site-specific area if available)	61.03	EPA Technical Background Document for SSLs (1996) Annual Estimate Q/C value for Minneapolis for a 5 acre source
Da	Apparent Diffusivity (cm ² /s) = $\{[(\theta_s^{100} \times D_i \times H') + (\theta_w^{100} \times D_w)] / n^2\} / (\rho_b \times K_d + \theta_s \times H')$	Chemical Specific	EPA Region IX PRG table
θ_w	Water filled soil porosity = $(f_m \times \rho_b)$	0.15	Calculated
θ_s	Air filled soil porosity = $n - \theta_w$	0.28	Calculated
n	Total soil porosity = $1 - (\rho_b / \rho_s)$	0.43	Calculated
f_m	Soil moisture content (cm ³ -water/g-soil)	0.1	Default, use site specific if available.
ρ_b	Dry soil bulk density (g/cm ³)	1.5	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)
ρ_s	Soil particle density (g/cm ³)	2.65	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)
D _i	Diffusivity in air (cm ² /s)	Chemical Specific	EPA Region IX PRG table
D _w	Diffusivity in water (cm ² /s)	Chemical Specific	EPA Region IX PRG table
H	Henry's constant (atm - m ³ /mol)	Chemical Specific	EPA Region IX PRG table
H'	dimensionless Henry's constant = $H \times 41$	Chemical Specific	Calculated
K _d	Soil-water partition coefficient (cm ³ /g) = $K_{oc} \times f_{oc}$	Chemical Specific	Calculated
K _{oc}	Organic carbon partition coefficient (cm ³ /g)	Chemical Specific	EPA Region IX PRG table
f _{oc}	Organic carbon content of soil	0.005	Default, use site specific if available.
T	Exposure interval (s)	7.88E+08	Assumes 350 days/year because Q/C is based on annual average.

Minor Construction/Utility Worker

Minor Construction/Utility Worker - Calculation of Chronic Particulate Emission Factor (PEF)

$$\text{PEF (m}^3/\text{kg)} = (\text{Q/C}) \times [(3600 \text{ sec/hr}) / (0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x))]$$

Variable	Definition	Variable Utilized	Rationale/Reference
PEF	Particulate Emission Factor (m ³ /kg)	3.83E+08	
(Q/C)	Inverse of the mean concentration at the center of a source (g/m ² -s per kg/m ³)	61.03	EPA Technical Background Document for SSLs (1996) Annual Estimate Q/C value for Minneapolis for a 5 acre source (Use site-specific if available)
V	Fraction of vegetative cover	0.00	Default. (Use Cowherd et al., 1985 and site data to develop site-specific value)
U _m	Mean annual windspeed (m/s)	4.92	Based on climatic data for Minneapolis/St. Paul metropolitan area (use Cowherd et al., 1985 and site data to develop site-specific value)
U _t	Equivalent threshold value of windspeed at 7 meters (m/s)	11.32	EPA Technical Background Document for SSLs (1996) Default. (Use Cowherd et al., 1985 and site data to develop site-specific value)
F(x)	Function dependent upon U _m /U _t	0.194	EPA Technical Background Document for SSLs (1996) Derived using Cowherd et al., 1985

Minor Construction/Utility Worker

Minor Construction/Utility Worker - Chronic Daily Air Concentration Estimation

Noncancer Evaluation: $ADC \text{ (mg/m}^3\text{)} = [Cs \times (1/VF + 1/PEF) \times EF \times ED]/AT$

Cancer Evaluation: $LADC \text{ (ug/m}^3\text{)} = [Cs \times (1/VF + 1/PEF) \times EF \times ED \times 1000 \text{ ug/mg}]/AT$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
1/VF	Inverse of the volatilization factor (kg/m ³)	Chemical specific calculation		EPA Methodology
1/PEF	Inverse of the particulate emission factor (kg/m ³)	2.6098E-09	NA	Based on EPA 1995 SSL Technical Support Document. Information for Minneapolis. Assumes limited disturbance of soil due to wind erosion. May not be protective for dusty conditions (e.g., vehicle traffic). Use site-specific data if possible.
EF	Exposure Frequency (day/yr)	80		VF and PEF utilize annual estimates.
ED	Exposure duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
AT	Averaging time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

M = between Central Tendency and Upper Bound Values

U = Upper Bound Value

Minor Construction/Utility Worker

Calculation of soil saturation limit (volatilization model is only applicable if C_s is $< C_{sat}$)

$$C_{sat} \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Variable	Definition	Variable Utilized	Rationale/Reference
C_{sat}	Soil Saturation Concentration (mg/kg)	C_{sat} back-calculated	
S	Solubility in water (mg/l)	Chemical Specific	
ρ_b	Soil bulk density (kg/l)	1.5	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)
K_d	Soil water partition coefficient (l/kg) $= K_{oc} \times f_{oc}$	Chemical -Specific/Site-Specific	
K_{oc}	Organic carbon partition coefficient (l/kg)	Chemical Specific	
f_{oc}	Organic carbon content of soil	0.005	Default, use site specific if available.
θ_w	Water filled soil porosity (unitless) $= f_m \times \rho_b$	0.150	Calculated
f_m	Average unsaturated zone soil gravimetric water content (kg water/kg soil)	0.1	Default. Use Site Specific information if available
H'	Modified Henry's constant $= 41 \times H$	Chemical Specific	
H	Henry's constant (atm · m ³ /mol)	Chemical Specific	
θ_a	Air-filled soil porosity (unitless) $= n - \theta_w$	0.28	Calculated
n	Total soil porosity (unitless) $= 1 - \rho_s/\rho_b$	0.43	Calculated
ρ_s	Soil density or particulate density (kg/l)	2.65	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)

C_{sat} for each contaminant is the concentration at which the adsorptive limit of the soil plus the theoretical dissolution limit of the contaminant in the available soil moisture has been reached. Concentrations $> C_{sat}$ indicates "free phase" contaminants within the soil matrix. The equation presented here is a modification of the equation presented in Part B RAGS guidance. The above equation takes into account the amount of contaminant that is in vapor phase in the pore spaces of the soil.

Minor Construction/Utility Worker

$$VF (m^3/kg) = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times \rho_b \times D_a)] \times 10^{-4} m^2/cm^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Inorganics							
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium III							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury (inorganic)	3.07E-02	6.30E-06	1.46E-05		5.20E+01	1.14E-02	2.64E+04
Nickel							
Potassium							
Selenium							
Sodium							
Thallium							
Vanadium							
Zinc							
Organics							
Acetone	1.00E-01	1.10E-05	4.19E-05	2.20E+00	1.10E-02	2.10E-05	1.56E+04
Benzene	8.80E-02	9.80E-06	2.26E-03	6.50E+01	3.25E-01	5.50E-03	2.13E+03
Bromomethane (methyl bromide)	1.00E-01	1.20E-05	1.70E-03	1.30E+02	6.50E-01	6.20E-03	2.46E+03

Minor Construction/Utility Worker

$$VF \text{ (m}^3\text{/kg)} = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times \rho_b \times D_a)] \times 10^{-4} \text{ m}^2\text{/cm}^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm ² /s)	Dw (cm ² /s)	Da (cm ² /s)	Koc (cm ³ /g)	Kd (cm ³ /g)	Henry's (atm-m ³ / mol)	Worker VF (m ³ /kg)
Butyl benzylphthalate							
Carbazole							
Carbon Disulfide	1.10E-01	1.00E-05	6.23E-03	5.40E+01	2.70E-01	1.20E-02	1.28E+03
Chlorobenzene	7.20E-02	6.80E-06	3.27E-04	3.30E+02	1.65E+00	3.70E-03	5.60E+03
4-Chloro-3-methylphenol							
Dibenzofuran (unsubstituted)	6.00E-02	1.00E-05	4.52E-08	7.80E+03	3.90E+01	1.30E-05	4.76E+05
Dibutyl phthalate							
1,1 - Dichloroethane	9.10E-02	1.10E-05	3.02E-03	3.00E+01	1.50E-01	4.30E-03	1.84E+03
1,2 - Dichloroethylene (mixed isomers)	7.90E-02	1.10E-05	2.55E-03	5.90E+01	2.95E-01	6.60E-03	2.00E+03
Dichloromethane (methylene chloride)	1.00E-01	1.17E-05	3.46E-03	8.80E+00	4.40E-02	2.60E-03	1.72E+03
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)							
Di - n - octyl phthalate	1.51E-02	3.58E-06	5.57E-12	8.00E+07	4.00E+05	6.68E-05	4.29E+07
Ethyl benzene	7.90E-02	7.80E-06	1.08E-03	2.20E+02	1.10E+00	7.90E-03	3.08E+03
Methyl ethyl ketone (2-butanone)	9.00E-02	9.80E-06	4.38E-05	4.50E+00	2.25E-02	2.70E-05	1.53E+04
Methyl butyl ketone (MBK)(2-hexanone)							
Methyl isobutyl ketone (MIBK)(4-meth	7.50E-02	7.80E-06	3.06E-05	1.30E+02	6.50E-01	1.40E-04	1.83E+04
PAHs (Polynuclear Aromatic Hydrocarbons)							
Acenaphthene	6.40E-02	7.70E-06	7.26E-06	4.60E+03	2.30E+01	1.20E-03	3.76E+04
Acenaphthylene	4.39E-02	7.07E-06	3.13E-07	7.00E+03	3.50E+01	1.14E-04	1.81E+05
Anthracene	5.80E-02	7.70E-06	6.69E-08	1.30E+04	6.50E+01	3.40E-05	3.91E+05
Benz[a]anthracene							
Benzo[b]fluoranthene							
Benzo(g,h,i)perylene							
Benzo[k]fluoranthene							
Benzo(a)pyrene							
Chrysene							
Dibenz[ah]anthracene							
Fluoranthene							
Fluorene	6.10E-02	7.90E-06	2.60E-07	7.90E+03	3.95E+01	7.70E-05	1.98E+05

Minor Construction/Utility Worker

$$VF \text{ (m}^3\text{/kg)} = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times \rho_b \times D_a)] \times 10^{-4} \text{ m}^2\text{/cm}^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm ² /s)	Dw (cm ² /s)	Da (cm ² /s)	Koc (cm ³ /g)	Kd (cm ³ /g)	Henry's (atm-m ³ / mol)	Worker VF (m ³ /kg)
Indeno[1,2,3-cd]pyrene							
2-Methylnaphthalene							
Naphthalene	6.90E-02	7.50E-06	2.96E-05	1.30E+03	6.50E+00	1.30E-03	1.86E+04
Phenanthrene							
Pyrene	2.70E-02	7.20E-06	1.06E-09	1.20E+05	6.00E+02	1.00E-05	3.11E+06
PCBs (Polychlorinated Biphenyls)							
Pentachlorophenol							
Phenol							
Styrene	7.10E-02	8.00E-06	1.86E-04	3.60E+02	1.80E+00	2.30E-03	7.42E+03
Tetrachloroethylene (PCE)	7.20E-02	8.20E-06	1.01E-03	6.60E+02	3.30E+00	2.30E-02	3.18E+03
Toluene	7.80E-02	8.60E-06	7.75E-04	2.60E+02	1.30E+00	6.60E-03	3.64E+03
1,1,1 - Trichloroethane	8.00E-02	8.80E-06	5.61E-04	1.50E+02	7.50E-01	2.80E-03	4.27E+03
Trichloroethylene (TCE)	8.10E-02	9.10E-06	1.92E-03	1.30E+02	6.50E-01	8.90E-03	2.31E+03
Xylenes (mixed)	7.20E-02	8.40E-06	6.22E-04	2.40E+02	1.20E+00	5.30E-03	4.06E+03

Minor Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Inorganics				
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium				
Cadmium				
Calcium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Iron				
Lead				
Magnesium				
Manganese				
Mercury (inorganic)				
Nickel				
Potassium				
Selenium				
Sodium				
Thallium				
Vanadium				
Zinc				
Organics				
Acetone	2.20E+00	1.00E+06	2.10E-05	111163
Benzene	6.50E+01	1.80E+03	5.50E-03	842
Bromomethane (methyl bromide)	1.30E+02	1.80E+04	6.20E-03	14366

Minor Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Butyl benzylphthalate				
Carbazole				
Carbon Disulfide	5.40E+01	2.90E+03	1.20E-02	1343
Chlorobenzene	3.30E+02	4.70E+02	3.70E-03	836
4-Chloro-3-methylphenol				
Dibenzofuran (unsubstituted)	7.80E+03	3.10E+00	1.30E-05	121
Dibutyl phthalate				
1,1 - Dichloroethane	3.00E+01	5.50E+03	4.30E-03	1559
1,2 - Dichloroethylene (mixed isomers)	5.90E+01	6.30E+03	6.60E-03	2811
Dichloromethane (methylene chloride)	8.80E+00	1.32E+04	2.60E-03	2167
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)				
Di - n - octyl phthalate	8.00E+07	2.00E-02	6.68E-05	8000
Ethyl benzene	2.20E+02	1.50E+02	7.90E-03	189
Methyl ethyl ketone (2-butanone)	4.50E+00	2.70E+05	2.70E-05	33132
Methyl butyl ketone (MBK)(2-hexanone)				
Methyl isobutyl ketone (MIBK)(4-meth	1.30E+02	1.90E+04	1.40E-04	14271
PAHs (Polynuclear Aromatic Hydrocarbons)				
Acenaphthene	4.60E+03	3.90E+00	1.20E-03	90
Acenaphthylene	7.00E+03	3.93E+00	1.14E-04	138
Anthracene	1.30E+04	7.50E-02	3.40E-05	5
Benz[a]anthracene				
Benzo[b]fluoranthene				
Benzo(g,h,i)perylene				
Benzo[k]fluoranthene				
Benzo(a)pyrene				
Chrysene				
Dibenz[ah]anthracene				
Fluoranthene				
Fluorene	7.90E+03	9.00E+01	7.70E-05	3564

Minor Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Indeno[1,2,3-cd]pyrene				
2-Methylnaphthalene				
Naphthalene	1.30E+03	2.40E+02	1.30E-03	1586
Phenanthrene	0.00E+00	0.00E+00	0.00E+00	0
Pyrene	1.20E+05	1.00E+02	1.00E-05	60010
PCBs (Polychlorinated Biphenyls)				
Pentachlorophenol				
Phenol				
Styrene	3.60E+02	6.80E+02	2.30E-03	1304
Tetrachloroethylene (PCE)	6.60E+02	1.50E+02	2.30E-02	537
Toluene	2.60E+02	8.80E+02	6.60E-03	1277
1,1,1 - Trichloroethane	1.50E+02	9.80E+02	2.80E-03	854
Trichloroethylene (TCE)	1.30E+02	1.00E+03	8.90E-03	819
Xylenes (mixed)	2.40E+02	2.00E+02	5.30E-03	268

Minor Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Inorganics											
Aluminum	3835	200	1.00E-06	1.00	80	25	70	9125	2.40E-03	25550	8.58E-04
Antimony	2.320	200	1.00E-06	1.00	80	25	70	9125	1.45E-06	25550	5.19E-07
Arsenic	3.080	200	1.00E-06	1.00	80	25	70	9125	1.93E-06	25550	6.89E-07
Barium	56.400	200	1.00E-06	1.00	80	25	70	9125	3.53E-05	25550	1.26E-05
Beryllium	0.186	200	1.00E-06	1.00	80	25	70	9125	1.16E-07	25550	4.16E-08
Cadmium	0.273	200	1.00E-06	1.00	80	25	70	9125	1.71E-07	25550	6.11E-08
Calcium	15437.000	200	1.00E-06	1.00	80	25	70	9125	9.67E-03	25550	3.45E-03
Chromium III	15.700	200	1.00E-06	1.00	80	25	70	9125	9.83E-06	25550	3.51E-06
Chromium VI	2.040	200	1.00E-06	1.00	80	25	70	9125	1.28E-06	25550	4.56E-07
Cobalt	6.090	200	1.00E-06	1.00	80	25	70	9125	3.81E-06	25550	1.36E-06
Copper	24.200	200	1.00E-06	1.00	80	25	70	9125	1.52E-05	25550	5.41E-06
Iron	10576.000	200	1.00E-06	1.00	80	25	70	9125	6.62E-03	25550	2.37E-03
Lead	18.900	200	1.00E-06	1.00	80	25	70	9125	1.18E-05	25550	4.23E-06
Magnesium	5182.000	200	1.00E-06	1.00	80	25	70	9125	3.25E-03	25550	1.16E-03
Manganese	591.000	200	1.00E-06	1.00	80	25	70	9125	3.70E-04	25550	1.32E-04
Mercury (inorganic)	0.037	200	1.00E-06	1.00	80	25	70	9125	2.32E-08	25550	8.28E-09
Nickel	13.800	200	1.00E-06	1.00	80	25	70	9125	8.64E-06	25550	3.09E-06
Potassium	380.000	200	1.00E-06	1.00	80	25	70	9125	2.38E-04	25550	8.50E-05
Selenium	0.190	200	1.00E-06	1.00	80	25	70	9125	1.19E-07	25550	4.25E-08
Sodium	136.000	200	1.00E-06	1.00	80	25	70	9125	8.52E-05	25550	3.04E-05
Thallium	0.164	200	1.00E-06	1.00	80	25	70	9125	1.03E-07	25550	3.67E-08
Vanadium	15.600	200	1.00E-06	1.00	80	25	70	9125	9.77E-06	25550	3.49E-06
Zinc	30.000	200	1.00E-06	1.00	80	25	70	9125	1.88E-05	25550	6.71E-06
Organics											
Acetone	0.184	200	1.00E-06	1.00	80	25	70	9125	1.15E-07	25550	4.12E-08
Benzene	0.000	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
Bromomethane (methyl bromide)	0.002	200	1.00E-06	1.00	80	25	70	9125	1.25E-09	25550	4.47E-10
Butyl benzylphthalate	0.016	200	1.00E-06	1.00	80	25	70	9125	1.00E-08	25550	3.58E-09

Minor Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Carbazole	0.247	200	1.00E-06	1.00	80	25	70	9125	1.55E-07	25550	5.52E-08
Carbon Disulfide	0.013	200	1.00E-06	1.00	80	25	70	9125	8.14E-09	25550	2.91E-09
Chlorobenzene	0.000	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	0.000	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
Dibenzofuran (unsubstituted)	0.225	200	1.00E-06	1.00	80	25	70	9125	1.41E-07	25550	5.03E-08
Dibutyl phthalate	0.028	200	1.00E-06	1.00	80	25	70	9125	1.75E-08	25550	6.26E-09
1,1 - Dichloroethane	0.006	200	1.00E-06	1.00	80	25	70	9125	3.44E-09	25550	1.23E-09
1,2 - Dichloroethylene (mixed isomers)	0.015	200	1.00E-06	1.00	80	25	70	9125	9.39E-09	25550	3.35E-09
Dichloromethane (methylene chloride)	0.000	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	0.325	200	1.00E-06	1.00	80	25	70	9125	2.04E-07	25550	7.27E-08
Di - n - octyl phthalate	0.040	200	1.00E-06	1.00	80	25	70	9125	2.50E-08	25550	8.95E-09
Ethyl benzene	0.010	200	1.00E-06	1.00	80	25	70	9125	6.26E-09	25550	2.24E-09
Methyl ethyl ketone (2-butanone)	0.521	200	1.00E-06	1.00	80	25	70	9125	3.26E-07	25550	1.17E-07
Methyl butyl ketone (MBK)(2-hexanone	0.026	200	1.00E-06	1.00	80	25	70	9125	1.63E-08	25550	5.81E-09
Methyl isobutyl ketone (MIBK)(4-methy	0.045	200	1.00E-06	1.00	80	25	70	9125	2.82E-08	25550	1.01E-08
PAHs (Polynuclear Aromatic Hydrocarbons)											
Acenaphthene	0.224	200	1.00E-06	1.00	80	25	70	9125	1.40E-07	25550	5.01E-08
Acenaphthylene	0.228	200	1.00E-06	1.00	80	25	70	9125	1.43E-07	25550	5.10E-08
Anthracene	0.214	200	1.00E-06	1.00	80	25	70	9125	1.34E-07	25550	4.79E-08
Benz[a]anthracene	0.340	200	1.00E-06	1.00	80	25	70	9125	2.13E-07	25550	7.60E-08
Benzo[b]fluoranthene	0.318	200	1.00E-06	1.00	80	25	70	9125	1.99E-07	25550	7.11E-08
Benzo(g,h,i)perylene	0.264	200	1.00E-06	1.00	80	25	70	9125	1.65E-07	25550	5.90E-08
Benzo[k]fluoranthene	0.270	200	1.00E-06	1.00	80	25	70	9125	1.69E-07	25550	6.04E-08
Benzo(a)pyrene	0.281	200	1.00E-06	1.00	80	25	70	9125	1.76E-07	25550	6.28E-08
Chrysene	0.306	200	1.00E-06	1.00	80	25	70	9125	1.92E-07	25550	6.84E-08
Dibenz[ah]anthracene	0.238	200	1.00E-06	1.00	80	25	70	9125	1.49E-07	25550	5.32E-08
Fluoranthene	0.405	200	1.00E-06	1.00	80	25	70	9125	2.54E-07	25550	9.06E-08
Fluorene	0.243	200	1.00E-06	1.00	80	25	70	9125	1.52E-07	25550	5.43E-08
Indeno[1,2,3-cd]pyrene	0.260	200	1.00E-06	1.00	80	25	70	9125	1.63E-07	25550	5.81E-08
2-Methylnaphthalene	0.209	200	1.00E-06	1.00	80	25	70	9125	1.31E-07	25550	4.67E-08

Minor Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Naphthalene	0.078	200	1.00E-06	1.00	80	25	70	9125	4.88E-08	25550	1.74E-08
Phenanthrene	0.339	200	1.00E-06	1.00	80	25	70	9125	2.12E-07	25550	7.58E-08
Pyrene	0.373	200	1.00E-06	1.00	80	25	70	9125	2.34E-07	25550	8.34E-08
PCBs (Polychlorinated Biphenyls)	0.049	200	1.00E-06	1.00	80	25	70	9125	3.07E-08	25550	1.10E-08
Pentachlorophenol	0.000	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
Phenol	0.054	200	1.00E-06	1.00	80	25	70	9125	3.38E-08	25550	1.21E-08
Styrene	0.033	200	1.00E-06	1.00	80	25	70	9125	2.07E-08	25550	7.38E-09
Tetrachloroethylene (PCE)	0.047	200	1.00E-06	1.00	80	25	70	9125	2.94E-08	25550	1.05E-08
Toluene	0.014	200	1.00E-06	1.00	80	25	70	9125	8.77E-09	25550	3.13E-09
1,1,1 - Trichloroethane	0.039	200	1.00E-06	1.00	80	25	70	9125	2.41E-08	25550	8.61E-09
Trichloroethylene (TCE)	0.080	200	1.00E-06	1.00	80	25	70	9125	5.01E-08	25550	1.79E-08
Xylenes (mixed)	0.037	200	1.00E-06	1.00	80	25	70	9125	2.33E-08	25550	8.32E-09

Minor Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm2)	CF (kg/mg)	AF (mg/cm2)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Inorganics												
Aluminum	3835.00	4900	1.00E-06	0.30	0.001	80	25	70	9125	1.77E-05	25550	6.30E-06
Antimony	2.32	4900	1.00E-06	0.30	0.001	80	25	70	9125	1.07E-08	25550	3.81E-09
Arsenic	3.08	4900	1.00E-06	0.30	0.03	80	25	70	9125	4.25E-07	25550	1.52E-07
Barium	56.40	4900	1.00E-06	0.30	0.001	80	25	70	9125	2.60E-07	25550	9.27E-08
Beryllium	0.19	4900	1.00E-06	0.30	0.001	80	25	70	9125	8.56E-10	25550	3.06E-10
Cadmium	0.27	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.26E-08	25550	4.49E-09
Calcium	15437.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Chromium III	15.70	4900	1.00E-06	0.30	0.01	80	25	70	9125	7.23E-07	25550	2.58E-07
Chromium VI	2.04	4900	1.00E-06	0.30	0.01	80	25	70	9125	9.39E-08	25550	3.35E-08
Cobalt	6.09	4900	1.00E-06	0.30	0.01	80	25	70	9125	2.80E-07	25550	1.00E-07
Copper	24.20	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.11E-06	25550	3.98E-07
Iron	10576.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Lead	18.90	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Magnesium	5182.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Manganese	591.00	4900	1.00E-06	0.30	0.001	80	25	70	9125	2.72E-06	25550	9.72E-07
Mercury (inorganic)	0.04	4900	1.00E-06	0.30	0.05	80	25	70	9125	8.52E-09	25550	3.04E-09
Nickel	13.80	4900	1.00E-06	0.30	0.01	80	25	70	9125	6.35E-07	25550	2.27E-07
Potassium	380.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Selenium	0.19	4900	1.00E-06	0.30	0.01	80	25	70	9125	8.75E-09	25550	3.12E-09
Sodium	136.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Thallium	0.16	4900	1.00E-06	0.30	0.01	80	25	70	9125	7.55E-09	25550	2.70E-09
Vanadium	15.60	4900	1.00E-06	0.30	0.01	80	25	70	9125	7.18E-07	25550	2.56E-07
Zinc	30.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.38E-06	25550	4.93E-07
Organics												
Acetone	0.18	4900	1.00E-06	0.30	0.1	80	25	70	9125	8.47E-08	25550	3.02E-08
Benzene	0.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	0.00E+00	25550	0.00E+00
Bromomethane (methyl bromide)	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	4.60E-10	25550	1.64E-10
Butyl benzylphthalate	0.02	4900	1.00E-06	0.30	0.1	80	25	70	9125	7.36E-09	25550	2.63E-09
Carbazole	0.25	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.14E-07	25550	4.06E-08
Carbon Disulfide	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	2.99E-09	25550	1.07E-09

Minor Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm ²)	CF (kg/mg)	AF (mg/cm ²)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Chlorobenzene	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	0.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Dibenzofuran (unsubstituted)	0.23	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.04E-07	25550	3.70E-08
Dibutyl phthalate	0.03	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.29E-08	25550	4.60E-09
1,1 - Dichloroethane	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.27E-09	25550	4.52E-10
1,2 - Dichloroethylene (mixed isomers)	0.02	4900	1.00E-06	0.30	0.05	80	25	70	9125	3.45E-09	25550	1.23E-09
Dichloromethane (methylene chloride)	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	0.33	4900	1.00E-06	0.30	0.05	80	25	70	9125	7.48E-08	25550	2.67E-08
Di - n - octyl phthalate	0.04	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.84E-08	25550	6.58E-09
Ethyl benzene	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	2.30E-09	25550	8.22E-10
Methyl ethyl ketone (2-butanone)	0.52	4900	1.00E-06	0.30	0.1	80	25	70	9125	2.40E-07	25550	8.56E-08
Methyl butyl ketone (MBK)(2-hexanone	0.03	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Methyl isobutyl ketone (MIBK)(4-methyl	0.05	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.04E-08	25550	3.70E-09
PAHs (Polynuclear Aromatic Hydrocarbons)												
Acenaphthene	0.22	4900	1.00E-06	0.30	0.05	80	25	70	9125	5.16E-08	25550	1.84E-08
Acenaphthylene	0.23	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Anthracene	0.21	4900	1.00E-06	0.30	0.1	80	25	70	9125	9.85E-08	25550	3.52E-08
Benz[a]anthracene	0.34	4900	1.00E-06	0.30	0.13	80	25	70	9125	2.03E-07	25550	7.27E-08
Benzo[b]fluoranthene	0.32	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.90E-07	25550	6.80E-08
Benzo(g,h,i)perylene	0.26	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Benzo[k]fluoranthene	0.27	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.62E-07	25550	5.77E-08
Benzo(a)pyrene	0.28	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.68E-07	25550	6.00E-08
Chrysene	0.31	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.83E-07	25550	6.54E-08
Dibenz[ah]anthracene	0.24	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.42E-07	25550	5.09E-08
Fluoranthene	0.41	4900	1.00E-06	0.30	0.13	80	25	70	9125	2.42E-07	25550	8.65E-08
Fluorene	0.24	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.12E-07	25550	3.99E-08
Indeno[1,2,3-cd]pyrene	0.26	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.56E-07	25550	5.56E-08
2-Methylnaphthalene	0.21	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Naphthalene	0.08	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.80E-08	25550	6.41E-09
Phenanthrene	0.34	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Pyrene	0.37	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.72E-07	25550	6.13E-08
PCBs (Polychlorinated Biphenyls)	0.05	4900	1.00E-06	0.30	0.15	80	25	70	9125	3.38E-08	25550	1.21E-08

Minor Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm2)	CF (kg/mg)	AF (mg/cm2)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Pentachlorophenol	0.00	4900	1.00E-06	0.30	0.25	80	25	70	9125	0.00E+00	25550	0.00E+00
Phenol	0.05	4900	1.00E-06	0.30	0.8	80	25	70	9125	1.99E-07	25550	7.10E-08
Styrene	0.03	4900	1.00E-06	0.30	0.05	80	25	70	9125	7.59E-09	25550	2.71E-09
Tetrachloroethylene (PCE)	0.05	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.08E-08	25550	3.86E-09
Toluene	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	3.22E-09	25550	1.15E-09
1,1,1 - Trichloroethane	0.04	4900	1.00E-06	0.30	0.05	80	25	70	9125	8.86E-09	25550	3.16E-09
Trichloroethylene (TCE)	0.08	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.84E-08	25550	6.58E-09
Xylenes (mixed)	0.04	4900	1.00E-06	0.30	0.05	80	25	70	9125	8.56E-09	25550	3.06E-09

Minor Construction/Utility Worker

Minor Construction/Utility Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Inorganics									
Aluminum	3835.00		2.6098E-09	80	25	9125	2.19E-06	25550	7.83E-04
Antimony	2.32		2.6098E-09	80	25	9125	1.33E-09	25550	4.74E-07
Arsenic	3.08		2.6098E-09	80	25	9125	1.76E-09	25550	6.29E-07
Barium	56.40		2.6098E-09	80	25	9125	3.23E-08	25550	1.15E-05
Beryllium	0.19		2.6098E-09	80	25	9125	1.06E-10	25550	3.80E-08
Cadmium	0.27		2.6098E-09	80	25	9125	1.56E-10	25550	5.58E-08
Calcium	15437.00		2.6098E-09	80	25	9125	8.83E-06	25550	3.15E-03
Chromium III	15.70		2.6098E-09	80	25	9125	8.98E-09	25550	3.21E-06
Chromium VI	2.04		2.6098E-09	80	25	9125	1.17E-09	25550	4.17E-07
Cobalt	6.09		2.6098E-09	80	25	9125	3.48E-09	25550	1.24E-06
Copper	24.20		2.6098E-09	80	25	9125	1.38E-08	25550	4.94E-06
Iron	10576.00		2.6098E-09	80	25	9125	6.05E-06	25550	2.16E-03
Lead	18.90		2.6098E-09	80	25	9125	1.08E-08	25550	3.86E-06
Magnesium	5182.00		2.6098E-09	80	25	9125	2.96E-06	25550	1.06E-03
Manganese	591.00		2.6098E-09	80	25	9125	3.38E-07	25550	1.21E-04
Mercury (inorganic)	0.04	3.78E-05	2.6098E-09	80	25	9125	3.07E-07	25550	1.10E-04
Nickel	13.80		2.6098E-09	80	25	9125	7.89E-09	25550	2.82E-06
Potassium	380.00		2.6098E-09	80	25	9125	2.17E-07	25550	7.76E-05
Selenium	0.19		2.6098E-09	80	25	9125	1.09E-10	25550	3.88E-08
Sodium	136.00		2.6098E-09	80	25	9125	7.78E-08	25550	2.78E-05
Thallium	0.16		2.6098E-09	80	25	9125	9.38E-11	25550	3.35E-08
Vanadium	15.60		2.6098E-09	80	25	9125	8.92E-09	25550	3.19E-06
Zinc	30.00		2.6098E-09	80	25	9125	1.72E-08	25550	6.13E-06
Organics									
Acetone	0.18	6.39E-05	2.6098E-09	80	25	9125	2.58E-06	25550	9.21E-04
Benzene	0.00	4.70E-04	2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
Bromomethane (methyl bromide)	0.00	4.07E-04	2.6098E-09	80	25	9125	1.78E-07	25550	6.37E-05
Butyl benzylphthalate	0.02		2.6098E-09	80	25	9125	9.15E-12	25550	3.27E-09
Carbazole	0.25		2.6098E-09	80	25	9125	1.41E-10	25550	5.05E-08

Minor Construction/Utility Worker

Minor Construction/Utility Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Carbon Disulfide	0.01	7.80E-04	2.6098E-09	80	25	9125	2.22E-06	25550	7.93E-04
Chlorobenzene	0.00	1.79E-04	2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	0.00		2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
Dibenzofuran (unsubstituted)	0.23	2.10E-06	2.6098E-09	80	25	9125	1.04E-07	25550	3.70E-05
Dibutyl phthalate	0.03		2.6098E-09	80	25	9125	1.60E-11	25550	5.72E-09
1,1 - Dichloroethane	0.01	5.43E-04	2.6098E-09	80	25	9125	6.54E-07	25550	2.34E-04
1,2 - Dichloroethylene (mixed isomers)	0.02	4.99E-04	2.6098E-09	80	25	9125	1.64E-06	25550	5.86E-04
Dichloromethane (methylene chloride)	0.00	5.81E-04	2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhe	0.33		2.6098E-09	80	25	9125	1.86E-10	25550	6.64E-08
Di - n - octyl phthalate	0.04	2.33E-08	2.6098E-09	80	25	9125	2.27E-10	25550	8.11E-08
Ethyl benzene	0.01	3.25E-04	2.6098E-09	80	25	9125	7.12E-07	25550	2.54E-04
Methyl ethyl ketone (2-butanone)	0.52	6.54E-05	2.6098E-09	80	25	9125	7.46E-06	25550	2.67E-03
Methyl butyl ketone (MBK)(2-hexanon	0.03		2.6098E-09	80	25	9125	1.49E-11	25550	5.31E-09
Methyl isobutyl ketone (MIBK)(4-meth	0.05	5.47E-05	2.6098E-09	80	25	9125	5.39E-07	25550	1.93E-04
PAHs (Polynuclear Aromatic Hydrocarbons)									
Acenaphthene	0.22	2.66E-05	2.6098E-09	80	25	9125	1.31E-06	25550	4.67E-04
Acenaphthylene	0.23	5.52E-06	2.6098E-09	80	25	9125	2.76E-07	25550	9.86E-05
Anthracene	0.21	2.56E-06	2.6098E-09	80	25	9125	1.20E-07	25550	4.29E-05
Benz[a]anthracene	0.34		2.6098E-09	80	25	9125	1.94E-10	25550	6.95E-08
Benzo[b]fluoranthene	0.32		2.6098E-09	80	25	9125	1.82E-10	25550	6.50E-08
Benzo(g,h,i)perylene	0.26		2.6098E-09	80	25	9125	1.51E-10	25550	5.39E-08
Benzo[k]fluoranthene	0.27		2.6098E-09	80	25	9125	1.54E-10	25550	5.52E-08
Benzo(a)pyrene	0.28		2.6098E-09	80	25	9125	1.61E-10	25550	5.74E-08
Chrysene	0.31		2.6098E-09	80	25	9125	1.75E-10	25550	6.25E-08
Dibenz[ah]anthracene	0.24		2.6098E-09	80	25	9125	1.36E-10	25550	4.86E-08
Fluoranthene	0.41		2.6098E-09	80	25	9125	2.32E-10	25550	8.27E-08
Fluorene	0.24	5.04E-06	2.6098E-09	80	25	9125	2.69E-07	25550	9.59E-05
Indeno[1,2,3-cd]pyrene	0.26		2.6098E-09	80	25	9125	1.49E-10	25550	5.31E-08
2-Methylnaphthalene	0.21		2.6098E-09	80	25	9125	1.20E-10	25550	4.27E-08
Naphthalene	0.08	5.38E-05	2.6098E-09	80	25	9125	9.20E-07	25550	3.28E-04
Phenanthrene	0.34		2.6098E-09	80	25	9125	1.94E-10	25550	6.93E-08

Minor Construction/Utility Worker

Minor Construction/Utility Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Pyrene	0.37	3.21E-07	2.6098E-09	80	25	9125	2.65E-08	25550	9.46E-06
PCBs (Polychlorinated Biphenyls)	0.05		2.6098E-09	80	25	9125	2.80E-11	25550	1.00E-08
Pentachlorophenol	0.00		2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
Phenol	0.05		2.6098E-09	80	25	9125	3.09E-11	25550	1.10E-08
Styrene	0.03	1.35E-04	2.6098E-09	80	25	9125	9.75E-07	25550	3.48E-04
Tetrachloroethylene (PCE)	0.05	3.14E-04	2.6098E-09	80	25	9125	3.24E-06	25550	1.16E-03
Toluene	0.01	2.75E-04	2.6098E-09	80	25	9125	8.44E-07	25550	3.01E-04
1,1,1 - Trichloroethane	0.04	2.34E-04	2.6098E-09	80	25	9125	1.98E-06	25550	7.05E-04
Trichloroethylene (TCE)	0.08	4.33E-04	2.6098E-09	80	25	9125	7.60E-06	25550	2.71E-03
Xylenes (mixed)	0.04	2.46E-04	2.6098E-09	80	25	9125	2.01E-06	25550	7.17E-04

Minor Construction/Utility Worker

Minor Construction/Utility Worker4. Summary of Exposure and Noncarcinogenic Risk Calculations

Chemical	Oral RfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation RIC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Inorganics														
Aluminum	1.00	2.40E-03	1.00	0.002	58%	1.77E-05	0.01	0.002	42%	NA	2.19E-06			0.004
Antimony	0.00	1.45E-06	1.00	0.004	87%	1.07E-08	0.05	0.001	13%	2.00E-04	1.33E-09	0.000	0%	0.004
Arsenic	0.00	1.93E-06	1.00	0.006	80%	4.25E-07	0.90	0.002	20%	5.00E-04	1.76E-09	0.000	0%	0.008
Barium	0.07	3.53E-05	1.00	0.001	78%	2.60E-07	0.05	0.000	12%	5.00E-04	3.23E-08	0.000	10%	0.001
Beryllium	0.00	1.16E-07	1.00	0.000	55%	8.56E-10	0.01	0.000	40%	2.00E-05	1.06E-10	0.000	5%	0.000
Cadmium	0.00	1.71E-07	1.00	0.000	93%	1.26E-08	1.00	0.000	7%	2.00E-04	1.56E-10	0.000	0%	0.000
Calcium	NA	9.67E-03	NA			NA	NA			NA	NA			
Chromium III	1.00	9.83E-06	1.00	0.000	40%	7.23E-07	0.05	0.000	60%	NA	8.98E-09			0.000
Chromium VI	0.01	1.28E-06	1.00	0.000	21%	9.39E-08	0.05	0.000	31%	2.00E-06	1.17E-09	0.001	48%	0.001
Cobalt	0.06	3.81E-06	1.00	0.000	83%	2.80E-07	0.50	0.000	12%	1.02E-03	3.48E-09	0.000	4%	0.000
Copper	0.04	1.52E-05	1.00	0.000	89%	1.11E-06	0.60	0.000	11%	NA	1.38E-08			0.000
Iron	NA	6.62E-03	NA			NA	NA			NA	NA			
Lead	NA	1.18E-05	NA			NA	NA			NA	NA			
Magnesium	NA	3.25E-03	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Manganese	0.05	3.70E-04	1.00	0.008	50%	2.72E-06	0.05	0.001	7%	5.00E-05	3.38E-07	0.007	43%	0.018
Mercury (inorganic)	0.00	2.32E-08	1.00	0.000	6%	8.52E-09	0.20	0.000	11%	3.00E-04	3.07E-07	0.001	82%	0.001
Nickel	0.02	8.64E-06	1.00	0.000	40%	6.35E-07	0.05	0.001	60%	NA	7.89E-09			0.001
Potassium	NA	2.38E-04	NA			NA	NA			NA	NA			
Selenium	0.01	1.19E-07	1.00	0.000	92%	8.75E-09	0.90	0.000	8%	NA	1.09E-10			0.000
Sodium	NA	8.52E-05	NA			NA	NA			NA	NA			
Thallium	0.00	1.03E-07	1.00	0.001	92%	7.55E-09	0.90	0.000	8%	NA	9.38E-11			0.001
Vanadium	0.01	9.77E-06	1.00	0.001	58%	7.18E-07	0.10	0.001	42%	NA	8.92E-09			0.002
Zinc	0.30	1.88E-05	1.00	0.000	80%	1.38E-06	0.30	0.000	20%	NA	1.72E-08			0.000
Organics														
Acetone	0.10	1.15E-07	1.00	0.000	12%	8.47E-08	0.90	0.000	10%	3.50E-01	2.58E-06	0.000	78%	0.000
Benzene	NA	0.00E+00	1.00			0.00E+00	0.90			6.00E-03	0.00E+00	0.000	#DIV/0!	0.000
Bromomethane (methyl bromide)	0.00	1.25E-09	1.00	0.000	2%	4.60E-10	0.90	0.000	1%	5.00E-03	1.78E-07	0.000	97%	0.000
Butyl benzylphthalate	0.20	1.00E-08	1.00	0.000	55%	7.36E-09	0.90	0.000	45%	NA	9.15E-12			0.000
Carbazole	NA	1.55E-07	1.00			1.14E-07	0.90			NA	1.41E-10			0.000
Carbon Disulfide	0.10	8.14E-09	1.00	0.000	2%	2.99E-09	0.90	0.000	1%	7.00E-01	2.22E-06	0.000	97%	0.000
Chlorobenzene	0.02	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	2.00E-02	0.00E+00	0.000	#DIV/0!	0.000
4-Chloro-3-methylphenol	NA	0.00E+00	NA			NA	NA			NA	0.00E+00			0.000
Dibenzofuran (unsubstituted)	0.00	1.41E-07	1.00	0.000	55%	1.04E-07	0.90	0.000	45%	NA	1.04E-07			0.000
Dibutyl phthalate	0.10	1.75E-08	1.00	0.000	55%	1.29E-08	0.90	0.000	45%	NA	1.60E-11			0.000
1,1 - Dichloroethane	0.10	3.44E-09	1.00	0.000	3%	1.27E-09	0.90	0.000	1%	5.00E-01	6.54E-07	0.000	96%	0.000
1,2 - Dichloroethylene (mixed isomers)	0.01	9.39E-09	1.00	0.000	2%	3.45E-09	0.90	0.000	1%	3.50E-02	1.64E-06	0.000	97%	0.000
Dichloromethane (methylene chloride)	0.06	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	3.00E+00	0.00E+00	0.000	#DIV/0!	0.000
Di(2 - ethylhexyl)phthalate (bis-ethylhex)	0.02	2.04E-07	1.00	0.000	66%	7.48E-08	0.70	0.000	34%	NA	1.86E-10			0.000

Minor Construction/Utility Worker

Minor Construction/Utility Worker4. Summary of Exposure and Noncarcinogenic Risk Calculations

Chemical	Oral RfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation RfC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Di - n - octyl phthalate	0.02	2.50E-08	1.00	0.000	55%	1.84E-08	0.90	0.000	45%	NA	2.27E-10			0.000
Ethyl benzene	0.10	6.26E-09	1.00	0.000	8%	2.30E-09	0.85	0.000	3%	1.00E+00	7.12E-07	0.000	89%	0.000
Methyl ethyl ketone (2-butanone)	0.60	3.26E-07	1.00	0.000	6%	2.40E-07	0.90	0.000	5%	1.00E+00	7.46E-06	0.000	88%	0.000
Methyl butyl ketone (MBK)(2-hexanone)	NA	1.63E-08	NA			NA	NA			NA	1.49E-11			
Methyl isobutyl ketone (MIBK)(4-methyl	0.08	2.82E-08	1.00	0.000	5%	1.04E-08	0.90	0.000	2%	8.00E-02	5.39E-07	0.000	93%	0.000
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	0.06	1.40E-07	1.00	0.000	24%	5.16E-08	0.80	0.000	11%	2.10E-01	1.31E-06	0.000	65%	0.000
Acenaphthylene	NA	1.43E-07	NA			NA	NA			NA	2.76E-07			
Anthracene	0.30	1.34E-07	1.00	0.000	52%	9.85E-08	0.80	0.000	48%	NA	1.20E-07			0.000
Benz[a]anthracene	NA	2.13E-07	1.00			2.03E-07	0.80			NA	1.94E-10			
Benzo[b]fluoranthene	NA	1.99E-07	1.00			1.90E-07	0.80			NA	1.82E-10			
Benzo(g,h,i)perylene	NA	1.65E-07	NA			NA	NA			NA	1.51E-10			
Benzo[k]fluoranthene	NA	1.69E-07	1.00			1.62E-07	0.80			NA	1.54E-10			
Benzo(a)pyrene	NA	1.76E-07	1.00			1.68E-07	0.80			NA	1.61E-10			
Chrysene	NA	1.92E-07	1.00			1.83E-07	0.80			NA	1.75E-10			
Dibenz[ah]anthracene	NA	1.49E-07	1.00			1.42E-07	0.80			NA	1.36E-10			
Fluoranthene	0.04	2.54E-07	1.00	0.000	46%	2.42E-07	0.80	0.000	54%	NA	2.32E-10			0.000
Fluorene	0.04	1.52E-07	1.00	0.000	41%	1.12E-07	0.80	0.000	38%	1.40E-01	2.69E-07	0.000	21%	0.000
Indeno[1,2,3-cd]pyrene	NA	1.63E-07	1.00			1.56E-07	0.80			NA	1.49E-10			
2-Methylnaphthalene	NA	1.31E-07	NA			NA	NA			NA	1.20E-10			
Naphthalene	0.04	4.88E-08	1.00	0.000	0%	1.80E-08	0.80	0.000	0%	1.00E-03	9.20E-07	0.001	100%	0.001
Phenanthrene	NA	2.12E-07	NA			NA	NA			NA	1.94E-10			
Pyrene	0.03	2.34E-07	1.00	0.000	51%	1.72E-07	0.80	0.000	47%	1.10E-01	2.65E-08	0.000	2%	0.000
PCBs (Polychlorinated Biphenyls)	0.00	3.07E-08	1.00	0.002	45%	3.38E-08	0.90	0.002	55%	NA	2.80E-11			0.003
Pentachlorophenol	0.03	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	2.00E-04	0.00E+00	0.000	#DIV/0!	0.000
Phenol	0.60	3.38E-08	1.00	0.000	13%	1.99E-07	0.90	0.000	87%	NA	3.09E-11			0.000
Styrene	0.20	2.07E-08	1.00	0.000	2%	7.59E-09	0.90	0.000	1%	2.00E-01	9.75E-07	0.000	97%	0.000
Tetrachloroethylene (PCE)	0.01	2.94E-08	1.00	0.000	24%	1.08E-08	0.90	0.000	10%	4.00E-01	3.24E-06	0.000	66%	0.000
Toluene	0.20	8.77E-09	1.00	0.000	2%	3.22E-09	0.90	0.000	1%	4.00E-01	8.44E-07	0.000	97%	0.000
1,1,1 - Trichloroethane	0.04	2.41E-08	1.00	0.000	23%	8.86E-09	0.90	0.000	10%	1.00E+00	1.98E-06	0.000	67%	0.000
Trichloroethylene (TCE)	NA	5.01E-08	1.00			1.84E-08	0.90			NA	7.60E-06			
Xylenes (mixed)	2.00	2.33E-08	1.00	0.000	0%	8.56E-09	0.90	0.000	0%	3.00E-01	2.01E-06	0.000	100%	0.000

SCREENING HI = 0.046

Minor Construction/Utility Worker

Minor Construction/Utility Worker5. Summary of Exposure and Carcinogenic Risk Calculations.

Chemical	Oral CSF (mg/kg-d) ⁻¹	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Inorganics														
Aluminum	NA	8.58E-04	1.00			6.30E-06	0.01			NA	7.83E-04			
Antimony	NA	5.19E-07	1.00			3.81E-09	0.05			NA	4.74E-07			
Arsenic	1.50	6.89E-07	1.00	1.03E-06	80%	1.52E-07	0.90	2.53E-07	20%	4.00E-03	6.29E-07	2.52E-09	0%	1.29E-06
Barium	NA	1.26E-05	1.00			9.27E-08	0.05			NA	1.15E-05			
Beryllium	NA	4.16E-08	1.00			3.06E-10	0.01			2.40E-03	3.80E-08	9.12E-11	100%	9.12E-11
Cadmium	NA	6.11E-08	1.00			4.49E-09	1.00			1.80E-03	5.58E-08	1.00E-10	100%	1.00E-10
Calcium	NA	3.45E-03	NA			NA	NA			NA	3.15E-03			
Chromium III	NA	3.51E-06	1.00			2.58E-07	0.05			NA	3.21E-06			
Chromium VI	NA	4.56E-07	1.00			3.35E-08	0.05			1.20E-02	4.17E-07	5.00E-09	100%	5.00E-09
Cobalt	NA	1.36E-06	1.00			1.00E-07	0.50			NA	1.24E-06			
Copper	NA	5.41E-06	1.00			3.98E-07	0.60			NA	4.94E-06			
Iron	NA	2.37E-03	NA			NA	NA			NA	2.16E-03			
Lead	NA	4.23E-06	NA			NA	NA			NA	3.86E-06			
Magnesium	NA	1.16E-03	NA			NA	NA			NA	1.06E-03			
Manganese	NA	1.32E-04	1.00			9.72E-07	0.05			NA	1.21E-04			
Mercury (inorganic)	NA	8.28E-09	1.00			3.04E-09	0.20			NA	1.10E-04			
Nickel	NA	3.09E-06	1.00			2.27E-07	0.05			4.80E-04	2.82E-06	1.35E-09	100%	1.35E-09
Potassium	NA	8.50E-05	NA			NA	NA			NA	7.76E-05			
Selenium	NA	4.25E-08	1.00			3.12E-09	0.90			NA	3.88E-08			
Sodium	NA	3.04E-05	NA			NA	NA			NA	2.78E-05			
Thallium	NA	3.67E-08	1.00			2.70E-09	0.90			NA	3.35E-08			
Vanadium	NA	3.49E-06	1.00			2.56E-07	0.10			NA	3.19E-06			
Zinc	NA	6.71E-06	1.00			4.93E-07	0.30			NA	6.13E-06			
Organics														
Acetone	NA	4.12E-08	1.00			3.02E-08	0.90			NA	9.21E-04			
Benzene	0.03	0.00E+00	1.00	0.00E+00	#DIV/0!	0.00E+00	0.90	0.00E+00	#DIV/0!	8.30E-06	0.00E+00	0.00E+00	#DIV/0!	0.00E+00
Bromomethane (methyl bromide)	NA	4.47E-10	1.00			1.64E-10	0.90			NA	6.37E-05			
Butyl benzylphthalate	NA	3.58E-09	1.00			2.63E-09	0.90			NA	3.27E-09			
Carbazole	0.02	5.52E-08	1.00	1.10E-09	55%	4.06E-08	0.90	9.02E-10	45%	NA	5.05E-08			2.01E-09
Carbon Disulfide	NA	2.91E-09	1.00			1.07E-09	0.90			NA	7.93E-04			
Chlorobenzene	NA	0.00E+00	1.00			0.00E+00	0.90			NA	0.00E+00			
4-Chloro-3-methylphenol	NA	0.00E+00	NA			NA	NA			NA	0.00E+00			
Dibenzofuran (unsubstituted)	NA	5.03E-08	1.00			3.70E-08	0.90			NA	3.70E-05			
Dibutyl phthalate	NA	6.26E-09	1.00			4.60E-09	0.90			NA	5.72E-09			
1,1 - Dichloroethane	0.01	1.23E-09	1.00	7.01E-12	2%	4.52E-10	0.90	2.86E-12	1%	1.60E-06	2.34E-04	3.74E-10	97%	3.84E-10
1,2 - Dichloroethylene (mixed isomers)	NA	3.35E-09	1.00			1.23E-09	0.90			NA	5.86E-04			
Dichloromethane (methylene chloride)	0.01	0.00E+00	1.00	0.00E+00	#DIV/0!	0.00E+00	0.90	0.00E+00	#DIV/0!	4.70E-07	0.00E+00	0.00E+00	#DIV/0!	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhex)	0.01	7.27E-08	1.00	1.02E-09	66%	2.67E-08	0.70	5.34E-10	34%	4.00E-06	6.64E-08	2.66E-13	0%	1.55E-09

Minor Construction/Utility Worker

Minor Construction/Utility Worker5. Summary of Exposure and Carcinogenic Risk Calculations.

Chemical	Oral CSF (mg/kg-d) ⁻¹	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Di - n - octyl phthalate	NA	8.95E-09	1.00			6.58E-09	0.90			NA	8.11E-08			
Ethyl benzene	NA	2.24E-09	1.00			8.22E-10	0.85			NA	2.54E-04			
Methyl ethyl ketone (2-butanone)	NA	1.17E-07	1.00			8.56E-08	0.90			NA	2.67E-03			
Methyl butyl ketone (MBK)(2-hexanone)	NA	5.81E-09	NA			NA	NA			NA	5.31E-09			
Methyl isobutyl ketone (MIBK)(4-methyl	NA	1.01E-08	1.00			3.70E-09	0.90			NA	1.93E-04			
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	NA	5.01E-08	1.00			1.84E-08	0.80			NA	4.67E-04			
Acenaphthylene	NA	5.10E-08	NA			NA	NA			NA	9.86E-05			
Anthracene	NA	4.79E-08	1.00			3.52E-08	0.80			NA	4.29E-05			
Benz[a]anthracene	0.73	7.60E-08	1.00	5.55E-08	46%	7.27E-08	0.80	6.63E-08	54%	1.70E-04	6.95E-08	1.18E-11	0%	1.22E-07
Benzo[b]fluoranthene	0.73	7.11E-08	1.00	5.19E-08	46%	6.80E-08	0.80	6.20E-08	54%	1.70E-04	6.50E-08	1.10E-11	0%	1.14E-07
Benzo(g,h,i)perylene	NA	5.90E-08	NA			NA	NA			NA	5.39E-08			
Benzo[k]fluoranthene	0.07	6.04E-08	1.00	4.41E-09	46%	5.77E-08	0.80	5.27E-09	54%	1.70E-05	5.52E-08	9.38E-13	0%	9.67E-09
Benzo(a)pyrene	7.30	6.28E-08	1.00	4.59E-07	46%	6.00E-08	0.80	5.48E-07	54%	1.70E-03	5.74E-08	9.76E-11	0%	1.01E-06
Chrysene	0.01	6.84E-08	1.00	5.00E-10	46%	6.54E-08	0.80	5.97E-10	54%	1.70E-06	6.25E-08	1.06E-13	0%	1.10E-09
Dibenz[ah]anthracene	7.30	5.32E-08	1.00	3.89E-07	46%	5.09E-08	0.80	4.64E-07	54%	1.70E-03	4.86E-08	8.27E-11	0%	8.53E-07
Fluoranthene	NA	9.06E-08	1.00			8.65E-08	0.80			NA	8.27E-08			
Fluorene	NA	5.43E-08	1.00			3.99E-08	0.80			NA	9.59E-05			
Indeno[1,2,3-cd]pyrene	0.73	5.81E-08	1.00	4.24E-08	46%	5.56E-08	0.80	5.07E-08	54%	1.70E-04	5.31E-08	9.03E-12	0%	9.32E-08
2-Methylnaphthalene	NA	4.67E-08	NA			NA	NA			NA	4.27E-08			
Naphthalene	NA	1.74E-08	1.00			6.41E-09	0.80			NA	3.28E-04			
Phenanthrene	NA	7.58E-08	NA			NA	NA			NA	6.93E-08			
Pyrene	NA	8.34E-08	1.00			6.13E-08	0.80			NA	9.46E-06			
PCBs (Polychlorinated Biphenyls)	2.00	1.10E-08	1.00	2.19E-08	45%	1.21E-08	0.90	2.68E-08	55%	2.20E-03	1.00E-08	2.20E-11	0%	4.88E-08
Pentachlorophenol	0.12	0.00E+00	1.00	0.00E+00	#DIV/0!	0.00E+00	0.90	0.00E+00	#DIV/0!	3.40E-05	0.00E+00	0.00E+00	#DIV/0!	0.00E+00
Phenol	NA	1.21E-08	1.00			7.10E-08	0.90			NA	1.10E-08			
Styrene	0.03	7.38E-09	1.00	2.21E-10	43%	2.71E-09	0.90	9.04E-11	18%	5.70E-07	3.48E-04	1.98E-10	39%	5.10E-10
Tetrachloroethylene (PCE)	0.05	1.05E-08	1.00	5.47E-10	65%	3.86E-09	0.90	2.23E-10	27%	5.80E-08	1.16E-03	6.70E-11	8%	8.37E-10
Toluene	NA	3.13E-09	1.00			1.15E-09	0.90			NA	3.01E-04			
1,1,1 - Trichloroethane	NA	8.61E-09	1.00			3.16E-09	0.90			NA	7.05E-04			
Trichloroethylene (TCE)	0.01	1.79E-08	1.00	1.97E-10	4%	6.58E-09	0.90	8.04E-11	2%	1.70E-06	2.71E-03	4.61E-09	94%	4.89E-09
Xylenes (mixed)	NA	8.32E-09	1.00			3.06E-09	0.90			NA	7.17E-04			

ECR = Excess Cancer Risk

TOTAL ECR = 3.55E-06

APPENDIX G.4
SHALLOW ZONE GROUNDWATER SPREADSHEETS

Last Update = October 1, 1997																
Hierarchy of values utilized is: Health Risk Limit, Health Risk Value, MCL, and Unit Risk Value or Lifetime Health Advisory Value.																
NOTE: MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																
The individual ratio calculated (column H) as well as the cumulative hazard index for a target endpoint should not exceed 1 (see footnote (b)).																
GROUNDWATER - SHALLOW ZONE																
Mixtures Evaluation																
Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)										
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LV	Prostate	REPRO	RESP	CANCER (RISK per 100,000)
INORGANICS																
Aluminum		50	SMCL	19400.00	388.000											
Ammonia	7664-41-7	30000	LHA		0.000											
Antimony	7440-36-0	8	HRL		0.000											
Arsenic (d)	7440-38-2	50	MCL	11.00	0.220											55.000
Asbestos (fibers > 10 um) (e)	1332-21-4	7	MCL		0.000											0.000
Barium	7440-39-3	2000	HRL	380.00	0.190		0.190									
Beryllium	7440-41-7	0.08	HRL	0.70	8.750											8.750
Boron	7440-42-8	800	HRL		0.000									0.000		
Bromate		10	MCL		0.000											
Cadmium	7440-43-8	4	HRL		0.000						0.000					
Chloramine (as free chlorine)		4000	MCL		0.000											
Chlorine	7782-50-5	4000	MCL		0.000											
Chlorine dioxide	10049-04-4	800	MCL		0.000											
Chlorite		1000	MCL		0.000											
Chromium (total)	7440-47-3	100	MCL	288.00	2.880											
Chromium III	18065-83-1	20000	HRL		0.000											
Chromium VI	18540-28-9	100	HBV		0.000							0.000				
Cobalt	7440-48-4	30	HBV	57.30	1.910							1.910				
Copper	7440-50-8	1000	HBV	172.00	0.172											
Cyanide, free	57-12-5	100	HRL	291.00	2.910			2.910								
Fluoride		4000	MCL		0.000											
Hypochlorite (regulated as chlorine)		4000	MCLG		0.000											
Hypochlorous acid (regulated as chlorine)		4000	MCLG		0.000											
Iron		300	MCLG	27000.00	90.000											
Lead (at tap)	7439-92-1	MA		17.70												
Manganese (HRL is currently being re-evaluated)	7439-98-5	100	HRL	3200.00	32.000			32.000								
Mercury (inorganic) (e.g. chloride, sulfate)	7439-97-6	2	MCL	0.28	0.130											
Molybdenum	7439-98-7	30	HBV		0.000											
Nickel (soluble salts)	7440-02-0	100	HRL	87.90	0.878											
Nitrate (as nitrogen)	14797-55-8	10000	HRL		0.000		0.000									
Nitrite	14797-85-0	1000	MCL		0.000											
Selenium	7782-49-2	30	HRL	142.00	4.733											
Silver	7440-22-4	30	HRL		0.000											
Strontium (non-radioactive, not 90Sr)	7440-24-6	4000	HBV		0.000	0.000										
Sulfate	0	500000	MCL		0.000											
Thallium	7440-28-0	0.8	HRL	2.20	3.867							3.867				
Tin	7440-31-5	4000	HRL		0.000											
Vanadium	7440-62-2	50	HRL	53.90	1.078											
White phosphorus	7723-14-0	0.1	LHA		0.000											
Zinc	7440-66-6	2000	HRL	159	0.080											
ORGANICS																
Acetochlor	34258-82-1	10	HBV		0.000		0.000					0.000				
Acetone	67-64-1	700	HRL	0.20	0.000						0.000					
Acetonitrile	75-05-8	40	HBV		0.000		0.000					0.000				
Acifluorfen	62476-59-8	10	SRL		0.000											0.000
Acrylamide	79-06-1	0.1	SRL		0.000											0.000
Acrylonitrile	107-13-1	0.8	SRL		0.000											0.000
Adipates (diethylhexyl)	0	400	MCL		0.000											
Alachlor	15972-80-8	4	HRL		0.000											0.000
Aldicarb	116-06-3	1	HRL		0.000			0.000								
Aldicarb+Aldicarb sulfone+Aldicarb sulfoxide (f)		7	MCL		0.000											
Aldrin	309-00-2	0.02	SRL		0.000											0.000

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												CANCER (RSEK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GL/IV	Prostate	REPRO	RESP	WHOLE BODY		
Allyl Chloride (3 chloropropene)	107-05-1	30	HRL		0.000			0.000										
Ametryn	934-12-8	60	LHA		0.000													
Ammonium sulfate	7773-08-0	2000	LHA		0.000													
Atrazine	1912-24-9	20	HRL		0.000		0.000											
Baygon	114-28-1	3	LHA		0.000												0.000	
Benflazoxon	25057-89-0	200	LHA		0.000													
Benzene	71-43-2	10	HRL	0.20	0.020												0.020	
Benzoic Acid	65-85-0	30000	HRL		0.000													
1,1-Biphenyl (Diphenyl)	92-52-4	300	HRL		0.000						0.000							
Bis(chloromethyl)ether (BCEE)	111-44-4	0.3	HRL		0.000												0.000	
Bis-2-chloroisopropyl ether	39838-32-9	300	LHA		0.000													
Bis(chloromethyl)ether (BCME)	542-86-1	0.002	HRL		0.000												0.000	
Bromacil	314-40-9	90	LHA		0.000													
Bromochloromethane	0	90	LHA		0.000													
Bromodichloromethane (THM) (g)	75-27-4	6	HRL		0.000												0.000	
Bromoform (THM) (g)	75-25-2	40	HRL		0.000												0.000	
Bromomethane (methyl bromide) (g)	74-83-9	10	HRL		0.000							0.000						
n-Butanol	71-36-3	700	HRL		0.000													
Butyl benzyl phthalate	85-88-7	100	HRL	6.00	0.060													
Butylate	2008-41-5	300	HBV		0.000								0.000					
Butylphthalyl butylglucolate (BPBG)	85-70-1	7000	HRL		0.000													
Carbaryl	83-25-2	700	LHA		0.000													
Carbofuran	1553-66-2	40	MCL		0.000													
Carbon Disulfide	75-15-0	700	HRL	31.00	0.044									0.044				
Carbon tetrachloride	58-23-5	3	HRL		0.000												0.000	
Carboxin	5234-68-4	700	LHA		0.000													
Chloral hydrate (HA) (h)	302-17-0	80	MCL		0.000													
Chloramben	133-90-4	100	HRL		0.000							0.000						
Chlordane	57-74-9	2	MCL		0.000												0.000	
Chlorobenzene	108-90-7	100	HRL		0.000							0.000						
Chlorodibromomethane (THM) (g)	124-48-1	80	MCL		0.000													
Chloroform (THM) (g)	67-68-3	80	HRL	0.70	0.012												0.012	
Chloromethane	74-87-3	3	LHA	0.50	0.187													
2-Chlorophenol	95-57-8	30	HRL		0.000									0.000				
Chlorothalonil	1897-45-6	30	HRL		0.000												0.000	
Chlorotoluene, o-	95-49-8	100	LHA		0.000													
Chlorotoluene, p-	0	100	LHA		0.000													
Chlorpyrifos	2821-88-2	20	HBV		0.000			0.000										
Cumene (Isopropyl benzene)	98-82-8	300	HRL		0.000													
Cyanazine	21725-46-2	0.4	HBV		0.000												0.000	
Datapon	75-89-0	200	MCL		0.000													
Diallate	2303-16-4	6	HBV		0.000												0.000	
Diazinon	333-41-5	0.6	LHA		0.000													
Dibromosetonitrile	0	20	LHA		0.000													
Dibromochloromethane	124-48-1	10	HRL		0.000							0.000						
Dibromochloropropane (DBCP)	98-12-8	0.2	MCL		0.000												0.000	
1,2-Dibromomethane (Ethylene dibromide)	106-93-4	0.004	HRL		0.000												0.000	
Dibutyl phthalate	84-74-2	700	HRL	1.00	0.001													
Dicamba	1918-00-9	200	HRL		0.000									0.000				
Dichloroacetic acid (HA) (i)	79-43-6	80	MCL		0.000													
Dichloroacetonitrile	0	8	LHA		0.000													
1,2-Dichlorobenzene (ortho-)	95-50-1	600	HRL		0.000							0.000						
1,3-Dichlorobenzene (meta-)	541-73-1	600	MCL		0.000													
1,4-Dichlorobenzene (para-)	108-46-7	10	HRL		0.000												0.000	
3,3'-Dichlorobenzidine	91-84-1	0.8	HRL		0.000												0.000	
Dichlorodifluoromethane (Freon 12)	75-71-8	1000	HRL		0.000													
p,p'-Dichlorodiphenyl dichloroethane (DDD)	72-54-8	1	HRL		0.000												0.000	
p,p'-Dichlorodiphenyl dichloroethylene (DDE)	72-55-9	1	HRL		0.000												0.000	
p,p'-Dichlorodiphenyl trichloroethane (DDT)	50-29-3	1	HRL		0.000												0.000	
1,1-Dichloroethane	75-34-3	70	HRL	110.00	1.371						1.571							
1,2-Dichloroethane	107-06-2	4	HRL	8.20	2.050												2.050	
1,1-Dichloroethylene (Vinylidene chloride)	75-35-4	6	HRL	380.00	63.333							63.333						
1,2-Dichloroethylene, cis-	156-59-2	70	HRL	1500.00	21.428		21.428											

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												WHOLE BODY	CANCER (RISK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LV	Prostate	REPRO	RESP				
1,2-Dichloroethylene, trans-	156-90-5	100	HRL	1900.00	19.000														
Dichloromethane (methylene chloride)	75-09-2	50	HRL	840.00	12.800													12.800	
2,4-Dichlorophenol	120-83-2	20	HRL		0.000					0.000									
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	70	HRL		0.000		0.000				0.000	0.000							
4-(2,4-Dichlorophenoxy)butyric acid (2,4-DB)	94-82-6	60	HBV		0.000		0.000												
1,2-Dichloropropane	78-87-5	5	HRL		0.000													0.000	
1,3-Dichloropropene (cis, trans-, mixture-)	542-75-8	2	HRL		0.000													0.000	
Dieldrin	60-57-1	0.02	SRL		0.000													0.000	
Di(2-ethylhexyl)adipate	103-23-1	400	MCL		0.000														
Di(2-ethylhexyl)phthalate (DEHP) (PAE)	117-81-7	100	HRL	1.00	0.010							0.010							
Diethyl phthalate (PAE)	84-66-2	8000	HRL		0.000														
Diisopropyl methylphosphonate	1445-75-8	800	LHA		0.000														
Dimethoate	80-51-5	1	HBV		0.000			0.000											
Dimethrin	67239-19-1	2000	LHA		0.000														
Dimethyl methylphosphonate	758-79-8	100	LHA		0.000														
2,4-Dimethylphenol	105-67-9	100	HRL	5.00	0.050		0.050												
Dimethyl phthalate (PAE)	131-11-3	70000	HRL		0.000						0.000								
1,3-Dinitrobenzene (m-)	89-85-0	1	LHA		0.000														
2,4-Dinitrophenol	51-28-5	10	HRL		0.000				0.000										
2,4-Dinitrotoluene	121-14-2	0.5	SRL		0.000													0.000	
2,6-Dinitrotoluene	806-20-2	0.5	SRL		0.000													0.000	
Dinitrotoluene mixture (technical grade)	0	0.5	SRL		0.000													0.000	
Dinoseb	88-85-7	7	HBV		0.000										0.000				
Dioxane, p- (1,4-Dioxane)	123-91-1	70	SRL		0.000													0.000	
Diphenamid	957-51-7	200	LHA		0.000														
Diphenylamine	122-39-4	200	LHA		0.000														
Diquat	85-00-7	20	MCL		0.000														
Disulfoton	298-04-4	0.3	HRL		0.000			0.000											
1,4-Dithiane	505-29-3	80	LHA		0.000														
Diuron	330-54-1	10	LHA		0.000														
Endosulf	145-73-3	100	MCL		0.000														
Endrin	72-20-8	2	HBV		0.000							0.000							
Epichlorohydrin	108-89-8	40	SRL		0.000													0.000	
Ethylbenzene	100-41-4	700	HRL	820.00	1.171						1.171	1.171							
S-Ethyl dipropylthio-carbamate (EPTC)	758-84-4	200	HRL		0.000		0.000	0.000											
Ethyl ether	60-29-7	1000	HRL		0.000														
Ethylene glycol	107-21-1	10000	HRL		0.000						0.000								
ETU (Ethylene Thiourea)	98-45-7	3	SRL		0.000													0.000	
Fenamiphos	222224-82-8	2	LHA		0.000														
Fluometuron	2164-17-2	90	LHA		0.000														
Fluorotrichloromethane	0	2000	LHA		0.000														
Fonofos	844-22-9	10	HBV		0.000			0.000											
Formaldehyde	50-00-0	1000	HRL		0.000							0.000							
Gasoline, unleaded (benzene)	0	5	LHA		0.000														
Glyphosate	1071-83-8	700	MCL		0.000														
Heptachlor	78-44-8	0.08	HRL		0.000													0.000	
Heptachlor epoxide	1024-57-3	0.04	HRL		0.000													0.000	
Hexachlorobenzene	118-74-1	0.2	HRL		0.000													0.000	
Hexachlorobutadiene (1,3-butadiene)	87-68-3	1	HRL		0.000							0.000							
Hexachlorocyclopentadiene	77-47-4	50	MCL		0.000														
Hexachloroethane	87-72-1	1	LHA		0.000														
Hexane (n-hexane)	110-54-3	400	HRL		0.000			0.000											
Hexazhene	51235-04-2	200	HBV		0.000														
HWX (Octahydro-1,3,5,7-tetraazoc-1,3,5,7-tetrazoc)	2691-41-0	300	HBV		0.000								0.000			0.000			
Isophorone	78-59-1	100	HRL		0.000						0.000								
Isopropyl methylphosphonate	0	700	LHA		0.000														
d-Limonene	5989-27-5	17500	HBV		0.000							0.000							
Lindane (HCH, gamma-)	58-89-9	0.2	MCL		0.000														
Linuron	330-55-2	1	HRL		0.000		0.000												
Malathion	121-75-5	100	HBV		0.000			0.000											
Maleic hydrazide	123-33-1	4000	LHA		0.000														
Methomyl	18752-77-5	200	LHA		0.000														
Methanol	67-56-1	3000	HRL		0.000			0.000				0.000							

Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LV	Prostate	REPRO	RESP	WHOLE BODY	CANCER (RISK per 100,000)	
Methoxychlor	72-43-5	40	MCL		0.000													
2-Methyl-4-chloro-phenoxyacetic acid (MCPA)	94-74-8	3	HRL		0.000						0.000	0.000						
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-85-2	7	HBV		0.000						0.000							
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	4000	HRL	270.00	0.008									0.088				
Methyl isobutyl ketone (MIBK)	108-10-1	300	HRL		0.000						0.000	0.000						
Methyl parathion	298-00-0	2	HBV		0.000		0.000	0.000										
Methyl tert butyl ether	1634-04-4	200	LHA		0.000													
2-Methylphenol (o-Cresol)	95-48-7	30	HRL	2.00	0.067			0.067										
3-Methylphenol (m-Cresol)	108-39-4	30	HRL		0.000			0.000										
4-Methylphenol (p-Cresol)	106-44-5	3	HRL	11.00	3.667													
Metolachlor	51218-45-2	100	HRL		0.000									0.000				
Mefibuzin	21087-64-9	200	HRL		0.000						0.000	0.000						
Monochlorobenzene	0	100	MCL		0.000													
Nitroguanidine	558-88-7	700	LHA		0.000													
Nitrophenols, p-	100-02-7	80	LHA		0.000													
2-Nitrophenol	88-75-7	200	HBV		0.000										0.000			
N-Nitrosodiphenylamine	86-30-8	70	HRL		0.000												0.000	
Oxamyl (Vydate)	23135-22-0	200	MCL		0.000													
Paraquat	1910-42-5	30	LHA		0.000													
Pendimethalin	40487-42-1	80	HBV		0.000							0.000						
Pentachlorophenol	87-86-5	3	HRL	3.00	1.000												1.000	
Phenol	108-95-2	4000	HRL	10.00	0.003										0.003			
Phorate	298-02-2	1	HBV		0.000			0.000										
Picloram	1918-02-1	500	HRL		0.000							0.000						
cPAHs (total carcinogenic as BaP)	0	0.05	HBV		0.000												0.000	
Benzo(a)anthracene	56-55-3	0.5	CALC		0.000												0.000	
Benzo(b)fluoranthene	205-99-2	0.5	CALC		0.000												0.000	
Benzo(k)fluoranthene	207-08-9	5	CALC		0.000												0.000	
Benzo(a)pyrene	50-32-8	0.05	HBV		0.000												0.000	
Chrysene	218-01-8	50	CALC		0.000												0.000	
Dibenz(a,h)anthracene	53-70-3	0.05	CALC		0.000												0.000	
Indeno(1,2,3-c,d)pyrene	193-39-5	0.5	CALC		0.000												0.000	
nPAHs																		
Acenaphthene	83-32-8	400	HRL		0.000							0.000						
Anthracene	120-12-7	2000	HRL		0.000													
Fluoranthene	208-44-0	300	HRL		0.000						0.000	0.000						
Fluorene (9H-Fluorene)	86-73-7	300	HRL		0.000		0.000											
Naphthalene	81-20-3	300	HRL	120.00	0.400													
Pyrene	129-00-0	200	HRL		0.000						0.000							
Polychlorinated biphenyls (PCBs)	1338-38-3	0.04	HRL		0.000												0.000	
Prometon	1810-18-0	100	HRL		0.000													
Pronamide	23850-58-5	50	LHA		0.000													
Propachlor	1918-18-7	80	HRL		0.000													
Propazine	139-40-2	10	HBV		0.000											0.000		
Propham	122-42-9	100	LHA		0.000													
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4	20	HBV		0.000								0.000					
Simazine	122-34-9	30	HRL		0.000		0.000											
Styrene	100-42-5	100	MCL		0.000													
Tebuthiuron	34014-18-1	500	LHA		0.000													
Terbacil	5802-51-2	80	LHA		0.000													
Terbufos	13071-79-9	0.2	HBV		0.000			0.000										
2,3,7,8-TCDD (Dioxin)	0	3.00E-05	MCL		0.000												0.000	
1,1,1,2-Tetrachloroethane	630-20-8	70	HRL		0.000						0.000	0.000						
1,1,2,2-Tetrachloroethane	78-34-5	2	HRL		0.000												0.000	
Tetrachloroethylene	127-18-4	7	HRL	180.00	22.857												22.857	
Tetrahydrofuran	109-99-9	100	HBV		0.000							0.000						
Toluene	108-88-3	1000	HRL	240.00	0.240						0.240	0.240						
Toxaphene	8001-35-2	0.3	HRL		0.000												0.000	
Triallate	2303-17-5	8	HBV		0.000							0.000						
Trichloroacetic acid (HA)	78-03-8	80	MCL		0.000													
1,2,4-Trichlorobenzene	120-82-1	70	MCL		0.000													
1,3,5-Trichlorobenzene	0	40	LHA		0.000													
1,1,1-Trichloroethane	71-55-8	800	HRL	680.00	1.150							1.150						

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)										WHOLE BODY	CANCER (RISK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP		
1,1,2-Trichloroethane	79-00-5	3	HRL	1.00	0.333					0.333							
Trichloroethylene (1,1,2; TCE)	79-01-6	30	HRL	140000.00	4666.667												4666.667
Trichlorofluoromethane (Freon 11)	75-69-4	2000	HRL		0.000												
2,4,6-Trichlorophenol	88-06-2	30	HRL		0.000												0.000
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	70	HRL		0.000		0.000							0.000			
2(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP)	93-72-1	80	HRL		0.000							0.000					
1,2,3-Trichloropropane	98-18-4	40	HRL		0.000						0.000	0.000					
1,1,2-Trichloro-1,2,2-bifluoroethane (Freon 113)	76-13-1	200000	HRL		0.000												
Trifluralin	1592-09-8	5	HBV		0.000		0.000					0.000					
1,3,5-Trinitrobenzene	89-35-4	0.3	HRL		0.000												
Trinitroglycerol		0	LHA		0.000												
Trinitrotoluene (2,4,6)	118-96-7	2	LHA		0.000												
Vinyl chloride	75-01-4	0.2	HRL	40.00	200.000												200.000
Xylene (mixture of o,m,p)	1330-20-7	10000	HRL	1530.00	0.153			0.153									
Radionuclides																	
Beta particles & photon activity (mrem)		0	4	MCL	0.000												based on yearly exposure
Gross alpha particle activity (pCi/l)		0	15	MCL	0.000												0.000
Radium 226 and 228 (pCi/l)	7440-14-4	5	MCL		0.000												0.000
Radon (pCi/l)	14859-87-7	300	MCL		0.000												0.000
Uranium	7440-61-1	20	MCL		0.000												
Cumulative Hazard Index (b) =						0.000	21.869	35.180	0.000	0.333	2.983	71.481	0.000	0.114	0.000	0.000	4989.155
FOOTNOTES:																	
(a) CALC - value calculated based on HBV for cPAHs (as benzo(a)pyrene) and provisional relative potency factors (EPA 1993)																	
HBV - Health Based Values derived by Minnesota Department of Health																	
HRL - Health Risk Level derived and promulgated in rule by Minnesota Department of Health																	
LHA - Lifetime Health Advisory Level																	
MCL - Maximum Contaminant Level																	
MCLG - Maximum Contaminant Level Goal																	
SMCL - Secondary Maximum Contaminant Level																	
SRL - Specific Risk Level (water concentration which corresponds to a risk of 1E-5)																	
(b) Individual HQ should not exceed 1. Cumulative Target Endpoint HI should not exceed 1. Cancer index indicates risk per 100,000 (e.g., index of 1 represents 1 in 100,000).																	
MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																	
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																	
(c) BONE - skeletal system; CV/BLD - cardiovascular or blood system; CNS/PNS - central or peripheral nervous system; EYE - eyes/sight; IMMUN - immune system; KIDN - kidney;																	
GI/LIV - gastrointestinal system or liver; RESP - respiratory system; REPRO - reproductive system including teratogenic and developmental effects; RESP - respiratory system;																	
WHOLE BODY - general effects like increased mortality or morbidity, decreased body weight, etc. and CANCER - carcinogenic effects.																	
(d) Arsenic - EPA MCL is under review - new MCL will probably be < 10 ug/L.																	
(e) MFL = million fibers per liter																	
(f) The MCLG/MCL or HA value for any two or more of these chemicals should remain at 7 ug/l because of similar modes of action.																	
(g) Total for all THMs combined can not exceed 80 ug/L																	
(h) Total for all haloacetic acids cannot exceed 60 ug/L																	

APPENDIX G.5
INTERMEDIATE ZONE GROUNDWATER SPREADSHEETS

Last Update = October 1, 1997																	
Hierarchy of values utilized is: Health Risk Limit, Health Risk Value, MCL, and Unit Risk Value or Lifetime Health Advisory Value.																	
NOTE: MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																	
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																	
The Individual ratio calculated (column H) as well as the cumulative hazard index for a target endpoint should not exceed 1 (see footnote b)).																	
GROUNDWATER - INTERMEDIATE ZONE																	
Mixtures Evaluation																	
Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)											
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP	WHOLE BODY	CANCER (Risk per 100,000)
INORGANICS																	
Aluminum		50	SMCL	712.00	14.240												
Ammonia	7664-41-7	30000	LHA		0.000												
Antimony	7440-36-0	8	HRL		0.000												
Arsenic (d)	7440-38-2	50	MCL	9.40	0.188												47.000
Asbestos (fibers > 10 um)	1332-21-4	7	MCL		0.000												0.000
Barium	7440-39-3	2000	HRL	89.70	0.045		0.045										
Beryllium	7440-41-7	0.08	HRL		0.000												0.000
Boron	7440-42-8	800	HRL		0.000									0.000			
Bromate		10	MCL		0.000												
Cadmium	7440-43-9	4	HRL		0.000						0.000						
Chloramine (as free chlorine)		4000	MCL		0.000												
Chlorine	7782-50-5	4000	MCL		0.000												
Chlorine dioxide	10049-04-4	800	MCL		0.000												
Chlorite		1000	MCL		0.000												
Chromium (total)	7440-47-3	100	MCL	26.70	0.267												
Chromium III	18065-83-1	20000	HRL		0.000												
Chromium VI	18540-29-9	100	HBV		0.000							0.000					
Cobalt	7440-48-4	30	HBV		0.000							0.000					
Copper	7440-50-8	1000	HBV	5.70	0.006												
Cyanide, free	57-12-5	100	HRL	8.60	0.086			0.086									
Fluoride		4000	MCL		0.000												
Hypochlorite (regulated as chlorine)		4000	MCLG		0.000												
Hypochlorous acid (regulated as chlorine)		4000	MCLG		0.000												
Iron		300	MCLG	11000.00	36.667												
Lead (at tap)	7439-92-1	NA															
Manganese (HRL is currently being re-evaluated)	7439-96-5	100	HRL	1760.00	17.600			17.600									
Mercury (inorganic) (e.g. chloride, sulfate)	7439-97-6	2	MCL	0.57	0.285												
Molybdenum	7439-98-7	30	HBV		0.000												
Nickel (soluble salts)	7440-02-0	100	HRL	5.20	0.052												
Nitrate (as nitrogen)	14797-55-8	10000	HRL		0.000		0.000										
Nitrite	14797-85-0	1000	MCL		0.000												
Selenium	7782-49-2	30	HRL		0.000												
Silver	7440-22-4	30	HRL		0.000												
Strontium (non-radioactive, not 90Sr)	7440-24-6	4000	HBV		0.000	0.000											
Sulfate	0	500000	MCL		0.000												
Thallium	7440-28-0	0.8	HRL		0.000							0.000					
Tin	7440-31-5	4000	HRL		0.000												
Vanadium	7440-82-2	50	HRL	3.10	0.062												
White phosphorus	7723-14-0	0.1	LHA		0.000												
Zinc	7440-66-8	2000	HRL	229	0.115												
ORGANICS																	
Acetochlor	34258-82-1	10	HBV		0.000		0.000					0.000					
Acetone	67-64-1	700	HRL		0.000						0.000						
Acetonitrile	75-05-8	40	HBV		0.000		0.000					0.000					
Acifluorfen	62476-59-8	10	SRL		0.000												0.000
Acrylamide	79-06-1	0.1	SRL		0.000												0.000
Acrylonitrile	107-13-1	0.6	SRL		0.000												0.000
Adipates (diethylhexyl)	0	400	MCL		0.000												
Alachlor	15972-60-8	4	HRL		0.000												0.000
Aldicarb	118-06-3	1	HRL		0.000			0.000									
Aldicarb+Aldicarb sulfone+Aldicarb sulfonide (f)		7	MCL		0.000												
Aldrin	309-00-2	0.02	SRL		0.000												0.000

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												CANCER (RISK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP	WHOLE BODY		
Allyl Chloride (3 chloropropene)	107-05-1	30	HRL		0.000			0.000										
Ametryn	834-12-8	60	LHA		0.000													
Ammonium sulfate	7773-06-0	2000	LHA		0.000													
Atrazine	1912-24-9	20	HRL		0.000		0.000											
Baygon	114-26-1	3	LHA		0.000												0.000	
Bentazon	25057-89-0	200	LHA		0.000													
Benzene	71-43-2	10	HRL		0.000												0.000	
Benzoic Acid	65-85-0	30000	HRL		0.000													
1,1-Biphenyl (Diphenyl)	92-52-4	300	HRL		0.000					0.000								
Bis(chloroethyl)ether (BCEE)	111-44-4	0.3	HRL		0.000												0.000	
Bis-2-chloroisopropyl ether	39638-32-9	300	LHA		0.000													
Bis(chloromethyl)ether (BCME)	542-88-1	0.002	HRL		0.000												0.000	
Bromacil	314-40-9	90	LHA		0.000													
Bromochloromethane	0	90	LHA		0.000													
Bromodichloromethane (THM)	(g)	75-27-4	6	HRL	0.000												0.000	
Bromoform (THM)	(g)	75-25-2	40	HRL	0.000												0.000	
Bromomethane (methyl bromide)	(g)	74-83-9	10	HRL	0.000							0.000						
n-Butanol	71-36-3	700	HRL		0.000			0.000										
Butyl benzyl phthalate	85-88-7	100	HRL		0.000													
Butylate	2008-41-5	300	HBV		0.000							0.000						
Butylphthalyl butylglucolate (BPPG)	85-70-1	7000	HRL		0.000													
Carbaryl	63-25-2	700	LHA		0.000													
Carbofuran	1553-66-2	40	MCL		0.000													
Carbon Disulfide	75-15-0	700	HRL		0.000									0.000				
Carbon tetrachloride	56-23-5	3	HRL		0.000												0.000	
Carboxin	5234-68-4	700	LHA		0.000													
Chloral hydrate (HA)	(h)	302-17-0	60	MCL	0.000													
Chloramben	133-90-4	100	HRL		0.000							0.000						
Chlordane	57-74-9	2	MCL		0.000												0.000	
Chlorobenzene	108-90-7	100	HRL		0.000							0.000						
Chlorodibromomethane (THM)	(g)	124-48-1	80	MCL	0.000													
Chloroform (THM)	(g)	67-86-3	60	HRL	0.000												0.000	
Chloromethane		74-87-3	3	LHA	0.400	1.20												
2-Chlorophenol	95-57-8	30	HRL		0.000									0.000				
Chlorothalonil	1897-45-6	30	HRL		0.000												0.000	
Chlorotoluene, o-	95-49-9	100	LHA		0.000													
Chlorotoluene, p-	0	100	LHA		0.000													
Chlorpyrifos	2921-88-2	20	HBV		0.000			0.000										
Cumene (Isopropyl benzene)	98-82-8	300	HRL		0.000													
Cyanazine	21725-46-2	0.4	HBV		0.000												0.000	
Dalapon	75-89-0	200	MCL		0.000													
Diallate	2303-16-4	6	HBV		0.000												0.000	
Diazinon	333-41-5	0.6	LHA		0.000													
Dibromoacetone	0	20	LHA		0.000													
Dibromochloromethane	124-48-1	10	HRL		0.000							0.000						
Dibromochloropropane (DBCP)	96-12-8	0.2	MCL		0.000												0.000	
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.004	HRL		0.000												0.000	
Dibutyl phthalate	84-74-2	700	HRL		0.000													
Dicamba	1918-00-9	200	HRL		0.000									0.000				
Dichloroacetic acid (HA) (i)	79-43-8	60	MCL		0.000													
Dichloroacetone	0	6	LHA		0.000													
1,2-Dichlorobenzene (ortho-)	95-50-1	600	HRL		0.000							0.000						
1,3-Dichlorobenzene (meta-)	541-73-1	600	MCL		0.000													
1,4-Dichlorobenzene (para-)	106-46-7	10	HRL		0.000												0.000	
3,3'-Dichlorobenzidine	91-84-1	0.8	HRL		0.000												0.000	
Dichlorodifluoromethane (Freon 12)	75-71-8	1000	HRL		0.000													
p,p'-Dichlorodiphenyl dichloroethane (DDD)	72-54-8	1	HRL		0.000												0.000	
p,p'-Dichlorodiphenyl dichloroethylene (DDE)	72-55-9	1	HRL		0.000												0.000	
p,p'-Dichlorodiphenyl trichloroethane (DDT)	50-29-3	1	HRL		0.000												0.000	
1,1-Dichloroethane	75-34-3	70	HRL	17.00	0.243							0.243						
1,2-Dichloroethane	107-08-2	4	HRL	1.70	0.425												0.425	
1,1-Dichloroethylene (Vinylidene chloride)	75-35-4	6	HRL	13.00	2.167							2.167						
1,2-Dichloroethylene, cis-	156-59-2	70	HRL	580.00	8.286		8.286											

Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)										WHOLE BODY	CANCER (RISK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LV	Prostate	REPRO	RESP		
1,2-Dichloroethene, trans-	156-60-5	100	HRL	1400.00	14.000												
Dichloromethane (methylene chloride)	75-09-2	50	HRL		0.000												0.000
2,4-Dichlorophenol	120-83-2	20	HRL		0.000					0.000							
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	70	HRL		0.000		0.000				0.000	0.000					
4-(2,4-Dichlorophenoxy)butyric acid (2,4-DB)	94-82-6	60	HBV		0.000		0.000										
1,2-Dichloropropane	78-87-5	5	HRL		0.000												0.000
1,3-Dichloropropane (cis-trans-, mixture-)	542-75-6	2	HRL		0.000												0.000
Dieldrin	60-57-1	0.02	SRL		0.000												0.000
Di(2-ethylhexyl)adipate	103-23-1	400	MCL		0.000												
Di(2-ethylhexyl)phthalate (DEHP) (PAE)	117-81-7	100	HRL		0.000							0.000					
Diethyl phthalate (PAE)	84-66-2	6000	HRL		0.000												
Diisopropyl methylphosphonate	1445-75-6	600	LHA		0.000												
Dimethoate	60-51-5	1	HBV		0.000			0.000									
Dimethrin	87239-18-1	2000	LHA		0.000												
Dimethyl methylphosphonate	758-79-8	100	LHA		0.000												
2,4-Dimethylphenol	105-87-9	100	HRL		0.000		0.000	0.000									
Dimethyl phthalate (PAE)	131-11-3	70000	HRL		0.000						0.000						
1,3-Dinitrobenzene (m-)	99-65-0	1	LHA		0.000												
2,4-Dinitrophenol	51-28-5	10	HRL		0.000				0.000								
2,4-Dinitrotoluene	121-14-2	0.5	SRL		0.000												0.000
2,6-Dinitrotoluene	806-20-2	0.5	SRL		0.000												0.000
Dinitrotoluene mixture (technical grade)	0	0.5	SRL		0.000												0.000
Dinoseb	89-85-7	7	HBV		0.000									0.000			
Dioxane, p- (1,4-Dioxane)	123-91-1	70	SRL		0.000												0.000
Diphenamid	957-51-7	200	LHA		0.000												
Diphenylamine	122-39-4	200	LHA		0.000												
Diquat	85-00-7	20	MCL		0.000												
Disulfoton	298-04-4	0.3	HRL		0.000			0.000									
1,4-Dithiane	505-29-3	80	LHA		0.000												
Diuron	330-54-1	10	LHA		0.000												
Endothal	145-73-3	100	MCL		0.000												
Endrin	72-20-8	2	HBV		0.000								0.000				
Epichlorohydrin	106-89-8	40	SRL		0.000												0.000
Ethylbenzene	100-41-4	700	HRL	0.30	0.000						0.000	0.000					
S-Ethyl dipropylthio-carbamate (EPTC)	759-94-4	200	HRL		0.000		0.000	0.000									
Ethyl ether	60-29-7	1000	HRL		0.000												
Ethylene glycol	107-21-1	10000	HRL		0.000						0.000						
ETU (Ethylene Thiourea)	96-45-7	3	SRL		0.000												0.000
Fenamphos	222224-92-6	2	LHA		0.000												
Fluometuron	2184-17-2	90	LHA		0.000												
Fluorotrichloromethane	0	2000	LHA		0.000												
Fonofos	944-22-9	10	HBV		0.000			0.000									
Formaldehyde	50-00-0	1000	HRL		0.000							0.000					
Gasoline, unleaded (benzene)	0	5	LHA		0.000												
Glyphosate	1071-83-6	700	MCL		0.000												
Heptachlor	76-44-8	0.08	HRL		0.000												0.000
Heptachlor epoxide	1024-57-3	0.04	HRL		0.000												0.000
Hexachlorobenzene	118-74-1	0.2	HRL		0.000												0.000
Hexachlorobutadiene (1,3-butadiene)	87-88-3	1	HRL		0.000						0.000						
Hexachlorocyclopentadiene	77-47-4	50	MCL		0.000												
Hexachloroethane	67-72-1	1	LHA		0.000												
Hexane (n-hexane)	110-54-3	400	HRL		0.000			0.000									
Hexachlorocyclopentadiene	51235-04-2	200	HBV		0.000											0.000	
HMW (Octahydro-1,3,5,7-tetraazocine-1,3,5,7-tetraazocine)	2691-41-0	300	HBV		0.000							0.000					
Isophorone	78-59-1	100	HRL		0.000						0.000						
Isopropyl methylphosphonate	0	700	LHA		0.000												
d-Limonene	5989-27-5	17500	HBV		0.000							0.000					
Lindane (HCH, gamma-)	58-89-8	0.2	MCL		0.000												
Linuron	330-55-2	1	HRL		0.000		0.000										
Malethion	121-75-5	100	HBV		0.000			0.000									
Maleic hydrazide	123-33-1	4000	LHA		0.000												
Methomyl	16752-77-5	200	LHA		0.000												
Methanol	67-56-1	3000	HRL		0.000			0.000				0.000					

Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												WHOLE BODY	CANCER (RSK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP				
Methoxychlor	72-43-5	40	MCL		0.000														
2-Methyl-4-chloro-phenoxyacetic acid (MCPA)	94-74-6	3	HRL		0.000						0.000	0.000							
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-65-2	7	HBV		0.000						0.000								
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	4000	HRL		0.000									0.000					
Methyl isobutyl ketone (MIBK)	108-10-1	300	HRL		0.000						0.000	0.000							
Methyl parathion	298-00-0	2	HBV		0.000		0.000	0.000											
Methyl tert butyl ether	1634-04-4	200	LHA		0.000														
2-Methylphenol (o-Cresol)	95-48-7	30	HRL		0.000			0.000											
3-Methylphenol (m-Cresol)	108-39-4	30	HRL		0.000			0.000											
4-Methylphenol (p-Cresol)	106-44-5	3	HRL		0.000														
Metolachlor	51218-45-2	100	HRL		0.000									0.000					
Metribuzin	21087-64-9	200	HRL		0.000						0.000	0.000							
Monochlorobenzene	0	100	MCL		0.000														
Nitroguanidine	556-88-7	700	LHA		0.000														
Nitrophenols, p-	100-02-7	60	LHA		0.000														
2-Nitrophenol	88-75-7	200	HBV		0.000										0.000				
N-Nitrosodiphenylamine	86-30-6	70	HRL		0.000												0.000		
Oxamyl (Vydate)	23135-22-0	200	MCL		0.000														
Paraquat	1810-42-5	30	LHA		0.000														
Pendimethalin	40487-42-1	90	HBV		0.000						0.000								
Pentachlorophenol	97-86-5	3	HRL		0.000												0.000		
Phenol	108-95-2	4000	HRL	1.00	0.000									0.000					
Phorate	298-02-2	1	HBV		0.000			0.000											
Picloram	1918-02-1	500	HRL		0.000						0.000								
cPAHs (total carcinogenic as BaP)	0	0.05	HBV		0.000												0.000		
Benzo(a)anthracene	56-55-3	0.5	CALC		0.000												0.000		
Benzo(b)fluoranthene	205-99-2	0.5	CALC		0.000												0.000		
Benzo(k)fluoranthene	207-08-9	5	CALC		0.000												0.000		
Benzo(e)pyrene	50-32-8	0.05	HBV		0.000												0.000		
Chrysene	218-01-9	50	CALC		0.000												0.000		
Dibenz(a,h)anthracene	53-70-3	0.05	CALC		0.000												0.000		
Indeno(1,2,3-c,d)pyrene	193-39-5	0.5	CALC		0.000												0.000		
nPAHs																			
Acenaphthene	83-32-9	400	HRL		0.000							0.000							
Anthracene	120-12-7	2000	HRL		0.000														
Fluoranthene	206-44-0	300	HRL		0.000						0.000	0.000							
Fluorene (9H-Fluorene)	86-73-7	300	HRL		0.000		0.000												
Naphthalene	91-20-3	300	HRL		0.000														
Pyrene	129-00-0	200	HRL		0.000						0.000								
Polychlorinated biphenyls (PCBs)	1336-36-3	0.04	HRL		0.000												0.000		
Prometon	1610-18-0	100	HRL		0.000														
Pronamide	23950-58-5	50	LHA		0.000														
Propachlor	1918-18-7	90	HRL		0.000														
Propazine	139-40-2	10	HBV		0.000														
Propham	122-42-9	100	LHA		0.000												0.000		
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4	20	HBV		0.000								0.000						
Simazine	122-34-9	30	HRL		0.000		0.000												
Styrene	100-42-5	100	MCL		0.000														
Tebuthiuron	34014-18-1	500	LHA		0.000														
Terbacil	5802-51-2	90	LHA		0.000														
Terbufos	13071-79-9	0.2	HBV		0.000			0.000											
2,3,7,8-TCDD (Dioxin)	0	3.00E-05	MCL		0.000												0.000		
1,1,1,2-Tetrachloroethane	630-20-8	70	HRL		0.000						0.000	0.000							
1,1,2,2-Tetrachloroethane	79-34-5	2	HRL		0.000												0.000		
Tetrachloroethylene	127-18-4	7	HRL	6.80	0.971												0.971		
Tetrahydrofuran	109-89-9	100	HBV		0.000							0.000							
Toluene	108-88-3	1000	HRL	1.60	0.002						0.002	0.002							
Toxaphene	8001-35-2	0.3	HRL		0.000												0.000		
Triallate	2303-17-5	8	HBV		0.000							0.000							
Trichloroacetic acid (TCA)	76-03-9	60	MCL		0.000														
1,2,4-Trichlorobenzene	120-82-1	70	MCL		0.000														
1,3,5-Trichlorobenzene	0	40	LHA		0.000														
1,1,1-Trichloroethane	71-55-6	600	HRL		0.000							0.000							

Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)											WHOLE BODY	CANCER (RSK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP			
1,1,2-Trichloroethane	79-00-5	3	HRL		0.000					0.000								
Trichloroethylene (1,1,2- TCE)	79-01-6	30	HRL	59000.00	1966.667												1966.667	
Trichlorofluoromethane (Freon 11)	75-69-4	2000	HRL		0.000													
2,4,6-Trichlorophenol	88-06-2	30	HRL		0.000												0.000	
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	70	HRL		0.000		0.000							0.000				
2(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP)	93-72-1	80	HRL		0.000							0.000						
1,2,3-Trichloropropane	96-18-4	40	HRL		0.000						0.000	0.000						
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	200000	HRL		0.000													
Trifluralin	1582-09-8	5	HBV		0.000		0.000					0.000						
1,3,5-Trinitrobenzene	98-35-4	0.3	HRL		0.000													
Trinitroglycerol	0	5	LHA		0.000													
Trinitrotoluene (2,4,6-)	118-96-7	2	LHA		0.000													
Vinyl chloride	75-01-4	0.2	HRL	9.50	47.500												47.500	
Xylene (mixture of o,m,p)	1330-20-7	10000	HRL	1.70	0.000			0.000										
Radionuclides																	based on yearly exposure	
Beta particles & photon activity (mrem)	0	4	MCL		0.000												0.000	
Gross alpha particle activity (pCi/l)	0	15	MCL		0.000												0.000	
Radium 226 and 228 (pCi/l)	7440-14-4	5	MCL		0.000												0.000	
Radon (pCi/l)	14859-67-7	300	MCL		0.000												0.000	
Uranium	7440-61-1	20	MCL		0.000													
Cumulative Hazard Index (b) =						0.000	8.331	17.888	0.000	0.000	0.245	2.169	0.000	0.000	0.000	0.000	2062.563	
FOOTNOTES:																		
(a) CALC - value calculated based on HBV for cPAHs (as benzo(a)pyrene) and provisional relative potency factors (EPA 1993)																		
HBV - Health Based Values derived by Minnesota Department of Health																		
HRL - Health Risk Level derived and promulgated in rule by Minnesota Department of Health																		
LHA - Lifetime Health Advisory Level																		
MCL - Maximum Contaminant Level																		
MCLG - Maximum Contaminant Level Goal																		
SMCL - Secondary Maximum Contaminant Level																		
SRL - Specific Risk Level (water concentration which corresponds to a risk of 1E-5)																		
(b) Individual HQ should not exceed 1. Cumulative Target Endpoint HI should not exceed 1. Cancer index indicates risk per 100,000 (e.g. index of 1 represents 1 in 100,000).																		
MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																		
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																		
(c) BONE - skeletal system; CV/BLD - cardiovascular or blood system; CNS/PNS - central or peripheral nervous system; EYE - eye/sight; IMMUN - immune system; KIDN - kidney;																		
GI/LIV - gastrointestinal system or liver; RESP - respiratory system; REPRO - reproductive system including teratogenic and developmental effects; RESP - respiratory system;																		
WHOLE BODY - general effects like increased mortality or morbidity, decreased body weight, etc. and CANCER - carcinogenic effects.																		
(d) Arsenic - EPA MCL is under review - new MCL will probably be < 10 ug/L																		
(e) MFL = million fibers per liter																		
(f) The MCLG/MCL or HA value for any two or more of these chemicals should remain at 7 ug/l because of similar modes of action																		
(g) Total for all THMs combined can not exceed 80 ug/L																		
(h) Total for all haloacetic acids cannot exceed 60 ug/L																		

APPENDIX G.6
DEEP ZONE GROUNDWATER SPREADSHEETS

Last Update = October 1, 1997																		
Hierarchy of values utilized is: Health Risk Limit, Health Risk Value, MCL, and Unit Risk Value or Lifetime Health Advisory Value.																		
NOTE: MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																		
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																		
The individual ratio calculated (column H) as well as the cumulative hazard index for a target endpoint should not exceed 1 (see footnote (b)).																		
GROUNDWATER - DEEP ZONE																		
Mixtures Evaluation																		
TARGET ENDPOINTS (c)																		
Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GILIV	Prostate	REPRO	RESP	WHOLE BODY	CANCER (RISK per 100,000)	
INORGANICS																		
Aluminum		50	SMCL	36.30	0.726													
Ammonia	7664-41-7	30000	LHA		0.000													
Antimony	7440-36-0	6	HRL		0.000													
Arsenic (d)	7440-38-2	50	MCL		0.000												0.000	
Asbestos (fibers/l > 10 um)	1332-21-4	7	MCL		0.000												0.000	
Barium	7440-39-3	2000	HRL	64.50	0.032		0.032											
Beryllium	7440-41-7	0.08	HRL		0.000												0.000	
Boron	7440-42-8	600	HRL		0.000									0.000				
Bromate		10	MCL		0.000													
Cadmium	7440-43-8	4	HRL		0.000						0.000							
Chloramine (as free chlorine)		4000	MCL		0.000													
Chlorine	7782-50-5	4000	MCL		0.000													
Chlorine dioxide	10049-04-4	800	MCL		0.000													
Chlorite		1000	MCL		0.000													
Chromium (total)	7440-47-3	100	MCL	16.20	0.162													
Chromium III	18085-83-1	20000	HRL		0.000													
Chromium VI	18540-29-8	100	HBV		0.000							0.000						
Cobalt	7440-48-4	30	HBV		0.000							0.000						
Copper	7440-50-8	1000	HBV		0.000													
Cyanide, free	57-12-5	100	HRL	9.00	0.090			0.090										
Fluoride		4000	MCL		0.000													
Hypochlorite (regulated as chlorine)		4000	MCLG		0.000													
Hypochlorous acid (regulated as chlorine)		4000	MCLG		0.000													
Iron		300	MCLG	2830.00	9.433													
Lead (at tap)	7439-92-1	NA		1.70														
Manganese (HRL is currently being re-evaluated)	7439-98-5	100	HRL	568.00	5.680			5.680										
Mercury (inorganic) (e.g. chloride, sulfate)	7439-97-8	2	MCL		0.000													
Molybdenum	7439-98-7	30	HBV		0.000													
Nickel (soluble salts)	7440-02-0	100	HRL		0.000													
Nitrate (as nitrogen)	14797-55-8	10000	HRL		0.000		0.000											
Nitrite	14797-85-0	1000	MCL		0.000													
Selenium	7782-49-2	30	HRL		0.000													
Silver	7440-22-4	30	HRL		0.000													
Strontium (non-radioactive, not 90Sr)	7440-24-8	4000	HBV		0.000	0.000												
Sulfate		500000	MCL		0.000													
Thallium	7440-28-0	0.6	HRL		0.000							0.000						
Tin	7440-31-5	4000	HRL		0.000													
Vanadium	7440-62-2	50	HRL		0.000													
White phosphorus	7723-14-0	0.1	LHA		0.000													
Zinc	7440-66-8	2000	HRL	27.7	0.014													
ORGANICS																		
Acetochlor	34258-82-1	10	HBV		0.000		0.000					0.000						
Acetone	67-64-1	700	HRL		0.000						0.000							
Acetonitrile	75-05-8	40	HBV		0.000		0.000					0.000						
Acifluorfen	82478-59-9	10	SRL		0.000												0.000	
Acrylamide	79-06-1	0.1	SRL		0.000												0.000	
Acrylonitrile	107-13-1	0.6	SRL		0.000												0.000	
Adipates (diethylhexyl)		400	MCL		0.000													
Alachlor	15972-80-8	4	HRL		0.000												0.000	
Aldicarb	118-08-3	1	HRL		0.000			0.000										
Aldicarb+Aldicarb sulfone+Aldicarb sulfoxide (f)		7	MCL		0.000													
Aldrin	309-00-2	0.02	SRL		0.000												0.000	

Chemical	CAS No	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)										WHOLE BODY	CANCER (RSK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GIL/IV	Prostate	REPRO	RESP		
Allyl Chloride (3 chloropropene)	107-05-1	30	HRL		0.000			0.000									
Amblyon	834-12-8	60	LHA		0.000												
Ammonium sulfate	7773-06-0	2000	LHA		0.000												
Atrazine	1912-24-9	20	HRL		0.000		0.000										
Baygon	114-26-1	3	LHA		0.000												0.000
Bentazon	25057-89-0	200	LHA		0.000												
Benzene	71-43-2	10	HRL		0.000												0.000
Benzoic Acid	85-85-0	30000	HRL		0.000												
1,1-Biphenyl (Diphenyl)	92-52-4	300	HRL		0.000						0.000						
Bis(chloroethyl)ether (BCEE)	111-44-4	0.3	HRL		0.000												0.000
Bis-2-chloroisopropyl ether	39638-32-9	300	LHA		0.000												
Bis(chloromethyl)ether (BCME)	542-88-1	0.002	HRL		0.000												0.000
Bromacil	314-40-9	90	LHA		0.000												
Bromochloromethane	0	90	LHA		0.000												
Bromodichloromethane (THM)	(g) 75-27-4	6	HRL		0.000												0.000
Bromoform (THM)	(g) 75-25-2	40	HRL		0.000												0.000
Bromomethane (methyl bromide)	(g) 74-83-9	10	HRL		0.000							0.000					
n-Butanol	71-36-3	700	HRL		0.000			0.000									
Butyl benzyl phthalate	85-89-7	100	HRL		0.000												
Butylate	2008-41-5	300	HBV		0.000							0.000					
Butylphthalyl butylglucolate (BPG)	85-70-1	7000	HRL		0.000												
Carbaryl	83-25-2	700	LHA		0.000												
Carbofuran	1553-86-2	40	MCL		0.000												
Carbon Disulfide	75-15-0	700	HRL		0.000									0.000			
Carbon tetrachloride	58-23-5	3	HRL		0.000												0.000
Carboxin	5234-89-4	700	LHA		0.000												
Chloral hydrate (HA)	(h) 302-17-0	60	MCL		0.000												
Chloramben	133-90-4	100	HRL		0.000							0.000					
Chlordane	57-74-9	2	MCL		0.000												0.000
Chlorobenzene	108-90-7	100	HRL		0.000							0.000					
Chlorodibromomethane (THM)	(g) 124-48-1	80	MCL		0.000												
Chloroform (THM)	(g) 67-66-3	80	HRL		0.000												0.000
Chloromethane	74-87-3	3	LHA	0.60	0.200												
2-Chlorophenol	95-57-9	30	HRL		0.000									0.000			
Chlorothalonil	1897-45-6	30	HRL		0.000												0.000
Chlorotoluene, o-	85-49-9	100	LHA		0.000												
Chlorotoluene, p-	0	100	LHA		0.000												
Chlorpyrifos	2921-88-2	20	HBV		0.000			0.000									
Cumene (isopropyl benzene)	98-82-9	300	HRL		0.000												
Cyanazine	21725-46-2	0.4	HBV		0.000												0.000
Dalapon	75-89-0	200	MCL		0.000												
Diallate	2303-16-4	6	HBV		0.000												0.000
Diazinon	333-41-5	0.6	LHA		0.000												
Dibromosuccinonitrile	0	20	LHA		0.000												
Dibromochloromethane	124-48-1	10	HRL		0.000							0.000					
Dibromochloropropane (DBCP)	86-12-8	0.2	MCL		0.000												0.000
1,2-Dibromomethane (Ethylene dibromide)	106-83-4	0.004	HRL		0.000												0.000
Dibutyl phthalate	84-74-2	700	HRL	1.00	0.001												
Dicamba	1918-00-9	200	HRL		0.000												
Dichloroacetic acid (HA) (f)	79-43-5	60	MCL		0.000												
Dichlorosuccinonitrile	0	6	LHA		0.000												
1,2-Dichlorobenzene (ortho)	85-50-1	600	HRL		0.000							0.000					
1,3-Dichlorobenzene (meta)	541-73-1	600	MCL		0.000												
1,4-Dichlorobenzene (para)	106-48-7	10	HRL		0.000												0.000
3,3'-Dichlorobenzidine	81-84-1	0.8	HRL		0.000												0.000
Dichlorodifluoromethane (Freon 12)	75-71-8	1000	HRL		0.000												
p,p'-Dichlorodiphenyl dichloroethane (DDD)	72-54-9	1	HRL		0.000												0.000
p,p'-Dichlorodiphenyl dichloroethylene (DDE)	72-55-9	1	HRL		0.000												0.000
p,p'-Dichlorodiphenyl trichloroethane (DDT)	50-29-3	1	HRL		0.000												0.000
1,1-Dichloroethane	75-34-3	70	HRL	0.90	0.013						0.013						
1,2-Dichloroethane	107-06-2	4	HRL		0.000												0.000
1,1-Dichloroethylene (Vinylidene chloride)	75-35-4	6	HRL	0.30	0.050							0.050					
1,2-Dichloroethylene, cis-	156-59-2	70	HRL	11.00	0.157		0.157										

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)												WHOLE BODY	CANCER (RISK per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GIA/IV	Prostate	REPRO	RESP				
1,2-Dichloroethylene, trans-	156-60-5	100	HRL	1.80	0.018														
Dichloromethane (methylene chloride)	75-09-2	50	HRL		0.000														0.000
2,4-Dichlorophenol	120-83-2	20	HRL		0.000					0.000									
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	70	HRL		0.000		0.000				0.000	0.000							
4-(2,4-Dichlorophenoxy)butyric acid (2,4-DB)	94-82-9	60	HBV		0.000		0.000												
1,2-Dichloropropane	78-87-5	5	HRL		0.000														0.000
1,3-Dichloropropene (cis-trans, mixture)	542-75-8	2	HRL		0.000														0.000
Dieldrin	60-57-1	0.02	SRL		0.000														0.000
Di(2-ethylhexyl)adipate	103-23-1	400	MCL		0.000														
Di(2-ethylhexyl)phthalate (DEHP) (PAE)	117-81-7	100	HRL		0.000							0.000							
Diethyl phthalate (PAE)	84-66-2	8000	HRL		0.000														
Diisopropyl methylphosphonate	1445-75-6	800	LHA		0.000														
Dimethoate	60-51-5	1	HBV		0.000			0.000											
Dimethrin	67239-18-1	2000	LHA		0.000														
Dimethyl methylphosphonate	756-79-8	100	LHA		0.000														
2,4-Dimethylphenol	105-87-9	100	HRL		0.000		0.000	0.000											
Dimethyl phthalate (PAE)	131-11-3	70000	HRL		0.000						0.000								
1,3-Dinitrobenzene (m-)	99-85-0	1	LHA		0.000														
2,4-Dinitrophenol	51-28-5	10	HRL		0.000				0.000										
2,4-Dinitrotoluene	121-14-2	0.5	SRL		0.000														0.000
2,6-Dinitrotoluene	606-20-2	0.5	SRL		0.000														0.000
Dinitrotoluene mixture (technical grade)	0	0.5	SRL		0.000														0.000
Dinoseb	88-85-7	7	HBV		0.000									0.000					
Dioxane, p- (1,4-Dioxane)	123-91-1	70	SRL		0.000														0.000
Diphenamid	957-51-7	200	LHA		0.000														
Diphenylamine	122-39-4	200	LHA		0.000														
Diquat	85-00-7	20	MCL		0.000														
Disulfoton	288-04-4	0.3	HRL		0.000			0.000											
1,4-Dithiane	505-28-3	80	LHA		0.000														
Duron	330-54-1	10	LHA		0.000														
Endosulf	145-73-3	100	MCL		0.000														
Endrin	72-20-8	2	HBV		0.000							0.000							
Epichlorohydrin	108-89-8	40	SRL		0.000														0.000
Ethylbenzene	100-41-4	700	HRL		0.000						0.000	0.000							
S-Ethyl dipropylthio-carbamate (EPTC)	759-94-4	200	HRL		0.000		0.000	0.000											
Ethyl ether	60-29-7	1000	HRL		0.000														
Ethylene glycol	107-21-1	10000	HRL		0.000						0.000								
ETU (Ethylene Thiourea)	98-45-7	3	SRL		0.000														0.000
Fenamiphos	222224-82-8	2	LHA		0.000														
Fluometuron	2184-17-2	80	LHA		0.000														
Fluorotrichloromethane	0	2000	LHA		0.000														
Fonofos	944-22-9	10	HBV		0.000			0.000											
Formaldehyde	50-00-0	1000	HRL		0.000							0.000							
Gasoline, unleaded (benzene)	0	5	LHA		0.000														
Glyphosate	1071-83-6	700	MCL		0.000														
Heptachlor	76-44-8	0.08	HRL		0.000														0.000
Heptachlor epoxide	1024-57-3	0.04	HRL		0.000														0.000
Hexachlorobenzene	118-74-1	0.2	HRL		0.000														0.000
Hexachlorobutadiene (1,3-butadiene)	87-68-3	1	HRL		0.000						0.000								
Hexachlorocyclopentadiene	77-47-4	50	MCL		0.000														
Hexachloroethane	87-72-1	1	LHA		0.000														
Hexane (n-hexane)	110-54-3	400	HRL		0.000			0.000											
Hexadnone	51235-04-2	200	HBV		0.000														0.000
HMX (Octahydro-1,3,5,7-tetraazabicyclo[3.3.1]non-2-ene)	2691-41-0	300	HBV		0.000							0.000							
Isophorone	78-59-1	100	HRL		0.000						0.000								
Isopropyl methylphosphonate	0	700	LHA		0.000														
d-Limonene	5989-27-6	17500	HBV		0.000							0.000							
Lindane (HCH gamma-)	58-89-9	0.2	MCL		0.000														
Linuron	330-55-2	1	HRL		0.000		0.000												
Malathion	121-75-5	100	HBV		0.000			0.000											
Maleic hydrazide	123-33-1	4000	LHA		0.000														
Methomyl	18752-77-5	200	LHA		0.000														
Methanol	67-56-1	3000	HRL		0.000			0.000				0.000							

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concentration (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)											
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GI/LIV	Prostate	REPRO	RESP	WHOLE BODY	CANCER (RSK per 100,000)
Methoxychlor	72-43-5	40	MCL		0.000												
2-Methyl-4-chloro-phenoxyacetic acid (MCPA)	94-74-6	3	HRL		0.000						0.000	0.000					
2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP)	93-85-2	7	HBV		0.000						0.000						
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	4000	HRL		0.000									0.000			
Methyl isobutyl ketone (MIBK)	108-10-1	300	HRL		0.000						0.000	0.000					
Methyl parathion	298-00-0	2	HBV		0.000		0.000	0.000									
Methyl tert butyl ether	1634-04-4	200	LHA		0.000												
2-Methylphenol (o-Cresol)	95-48-7	30	HRL		0.000			0.000									
3-Methylphenol (m-Cresol)	108-39-4	30	HRL		0.000			0.000									
4-Methylphenol (p-Cresol)	106-44-5	3	HRL		0.000												
Metolachlor	51218-45-2	100	HRL		0.000									0.000			
Metribuzin	21087-64-9	200	HRL		0.000						0.000	0.000		0.000			
Monochlorobenzene	0	100	MCL		0.000												
Nitroguanidine	558-88-7	700	LHA		0.000												
Nitrophenols, p-	100-02-7	80	LHA		0.000												
2-Nitrophenol	88-75-7	200	HBV		0.000										0.000		
N-Nitrosodiphenylamine	98-30-8	70	HRL		0.000												0.000
Oxamyl (Vydate)	23135-22-0	200	MCL		0.000												
Paraquat	1910-42-5	30	LHA		0.000												
Pendimethalin	40487-42-1	80	HBV		0.000							0.000					
Pentachlorophenol	87-88-5	3	HRL		0.000												0.000
Phenol	108-95-2	4000	HRL		0.000									0.000			
Phorate	298-02-2	1	HBV		0.000			0.000									
Picloram	1918-02-1	500	HRL		0.000							0.000					
cPAHs (total carcinogenic as BaP)	0	0.05	HBV		0.000												0.000
Benz(a)anthracene	56-55-3	0.5	CALC		0.000												0.000
Benzo(b)fluoranthene	205-98-2	0.5	CALC		0.000												0.000
Benzo(k)fluoranthene	207-08-8	5	CALC		0.000												0.000
Benzo(a)pyrene	50-32-8	0.05	HBV		0.000												0.000
Chrysene	218-01-9	30	CALC		0.000												0.000
Dibenz(a,h)anthracene	53-70-3	0.05	CALC		0.000												0.000
Indeno(1,2,3-c,d)pyrene	193-39-5	0.5	CALC		0.000												0.000
nPAHs																	
Acenaphthene	83-32-8	400	HRL		0.000							0.000					
Anthracene	120-12-7	2000	HRL		0.000												
Fluoranthene	206-44-0	300	HRL		0.000						0.000	0.000					
Fluorene (Bt-Fluorene)	86-73-7	300	HRL		0.000		0.000										
Naphthalene	91-20-3	300	HRL		0.000												
Pyrene	129-00-0	200	HRL		0.000						0.000						
Polychlorinated biphenyls (PCBs)	1336-36-3	0.04	HRL		0.000												0.000
Prometon	1610-18-0	100	HRL		0.000												
Pronamide	23950-58-5	50	LHA		0.000												
Propachlor	1918-16-7	90	HRL		0.000												
Propazine	139-40-2	10	HBV		0.000											0.000	
Propham	122-42-9	100	LHA		0.000												
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4	20	HBV		0.000								0.000				
Simazine	122-34-9	30	HRL		0.000		0.000										
Styrene	100-42-5	100	MCL		0.000												
Tebuthiuron	34014-18-1	500	LHA		0.000												
Terbacil	5802-51-2	80	LHA		0.000												
Terbufos	13071-78-9	0.2	HBV		0.000			0.000									
2,3,7,8-TCDD (Dioxin)	0	3.00E-05	MCL		0.000												0.000
1,1,1,2-Tetrachloroethane	630-20-6	70	HRL		0.000						0.000	0.000					
1,1,2,2-Tetrachloroethane	78-34-5	2	HRL		0.000												0.000
Tetrachloroethylene	127-18-4	7	HRL	22.00	3.143												3.143
Tetrahydrofuran	109-99-9	100	HBV		0.000							0.000					
Toluene	108-89-3	1000	HRL	0.20	0.000						0.000	0.000					
Toxaphene	8001-35-2	0.3	HRL		0.000												0.000
Triallate	2303-17-5	9	HBV		0.000							0.000					
Trichloroacetic acid (TAA)	78-03-9	60	MCL		0.000												
1,2,4-Trichlorobenzene	120-82-1	70	MCL		0.000												
1,3,5-Trichlorobenzene	0	40	LHA		0.000												
1,1,1-Trichloroethane	71-55-6	800	HRL		0.000							0.000					

Chemical	CAS No.	Drinking Water Criteria (ug/L)	Basis (a)	Site/Well Concent. (ug/L)	Ratio (b)	TARGET ENDPOINTS (c)													WHOLE BODY	CANCER (risk per 100,000)
						BONE	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	GII/LV	Prostate	REPRO	RESP					
1,1,2-Trichloroethane	79-00-5	3	HRL		0.000					0.000										
Trichloroethylene (1,1,2; TCE)	79-01-6	30	HRL	61.00	2.033														2.033	
Trichlorofluoromethane (Freon 11)	75-69-4	2000	HRL		0.000															
2,4,6-Trichlorophenol	88-08-2	30	HRL		0.000														0.000	
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	70	HRL		0.000		0.000								0.000					
2(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP)	93-72-1	60	HRL		0.000							0.000	0.000							
1,2,3-Trichloropropane	96-18-4	40	HRL		0.000						0.000	0.000								
1,1,2-Trichloro-1,2,2-bifluoroethane (Freon 113)	76-13-1	200000	HRL		0.000															
Trifluralin	1582-08-8	5	HBV		0.000		0.000					0.000								
1,3,5-Trinitrobenzene	99-35-4	0.3	HRL		0.000															
Trinitroglycerol	0	5	LHA		0.000															
Trinitrotoluene (2,4,6-)	118-96-7	2	LHA		0.000															
Vinyl chloride	75-01-4	0.2	HRL		0.000														0.000	
Xylene (mixture of o,m,p)	1330-20-7	10000	HRL		0.000			0.000												
Radionuclides																				
Beta particles & photon activity (mrem)	0	4	MCL		0.000														based on yearly exposure	
Gross alpha particle activity (pCi/l)	0	15	MCL		0.000														0.000	
Radium 226 and 228 (pCi/l)	7440-14-4	5	MCL		0.000														0.000	
Radon (pCi/l)	14859-87-7	300	MCL		0.000														0.000	
Uranium	7440-61-1	20	MCL		0.000															
Cumulative Hazard Index (b) =						0.000	0.189	5.750	0.000	0.000	0.013	0.050	0.000	0.000	0.000	0.000	0.000	5.176		
FOOTNOTES:																				
(a) CALC - value calculated based on HBV for cPAHs (as benzo(a)pyrene) and provisional relative potency factors (EPA 1993)																				
HBV - Health Based Values derived by Minnesota Department of Health																				
HRL - Health Risk Level derived and promulgated in rule by Minnesota Department of Health																				
LHA - Lifetime Health Advisory Level																				
MCL - Maximum Contaminant Level																				
MCLG - Maximum Contaminant Level Goal																				
SMCL - Secondary Maximum Contaminant Level																				
SRL - Specific Risk Level (water concentration which corresponds to a risk of 1E-5)																				
(b) Individual HQ should not exceed 1. Cumulative Target Endpoint HI should not exceed 1. Cancer index indicates risk per 100,000 (e.g., index of 1 represents 1 in 100,000).																				
MCL are not strictly health-based. Cumulative cancer risk will include MCL only if specific risk level for carcinogenicity is available.																				
Additivity will not include MCLs or Lifetime Health Advisory Value for noncarcinogenic effects since target endpoints are not specified.																				
(c) BONE - skeletal system; CV/BLD - cardiovascular or blood system; CNS/PNS - central or peripheral nervous system; EYE - eye/sight; IMMUN - immune system; KIDN - kidney; GII/LV - gastrointestinal system or liver; RESP - respiratory system; REPRO - reproductive system including teratogenic and developmental effects; RESP - respiratory system; WHOLE BODY - general effects like increased mortality or morbidity, decreased body weight, etc. and CANCER - carcinogenic effects.																				
(d) Arsenic - EPA MCL is under review - new MCL will probably be < 10 ug/L.																				
(e) MFL = million fibers per liter																				
(f) The MCLG/MCL or HA value for any two or more of these chemicals should remain at 7 ug/l because of similar modes of action.																				
(g) Total for all THMs combined can not exceed 80 ug/L																				
(h) Total for all haloacetic acids cannot exceed 60 ug/L																				

APPENDIX G.7
SAMPLE CALCULATIONS

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Construction Worker via ^{MAJOR} Soil Ingestion			
BASIS ON	RAGS EPA, 1989		DRAWING NUMBER	Soil Ingestion
BY	KAC	CHECKED BY	RJF	APPROVED BY
			DATE	8/18/98

Purpose: To Calculate Carcinogenic and nonCarcinogenic risk for the Construction/Utility Worker via Subchronic Ingestion of Chemicals in Soil.

Equation:

$$\text{Intake (mg/kg-day)} = \frac{C_s \times IR \times CF \times FI \times EF}{BW \times AT}$$

Where:

C_s	= Chemical Concentration in Soil (mg/kg)	Chemical-specific
IR	= Ingestion Rate (mg soil/day)	480
CF	= Conversion Factor (kg/mg)	$1.00E-6$
FI	= Fraction Ingested (unitless)	1.00
EF	= Exposure Frequency (days)	48
BW	= Body Weight (kg)	70
AT_N	= Averaging Time Noncarcinogen (days)	91
AT_C	= Averaging Time Carcinogen (days)	25,550

$$\begin{aligned} \text{Noncarcinogenic Intake (mg/kg-day)} &= \frac{C_s (\text{mg/kg}) \times 480 (\text{mg/day}) \times 1.0E-6 (\text{kg/mg}) \times 1.0 \times 48 (\text{days})}{70 \text{ kg} \times 91 \text{ days}} \\ &= C_s \times 5.88E-6 \text{ mg/kg-day} \end{aligned}$$

where C_s for arsenic = 13.8 mg/kg

$$= 13.8 \times 5.88E-6 \text{ mg/kg-day} = \boxed{8.11E-5 \text{ mg/kg-day}}$$

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker via			
BASED ON	RAGs	EPA, 1989	DRAWING NUMBER	Soil Augeration
BY	KAC	CHECKED BY	RJJ	APPROVED BY
				DATE 8/18/98

$$\begin{aligned} \text{Carcinogenic Intake (mg/kg-day)} &= \frac{C_s (\text{mg/kg}) \times 480 (\text{mg/day}) \times 1.0 \text{E-}6 (\text{kg/mg}) \times 1.0 \times 78 (\text{days})}{70 \text{ kg} \times 25,550 \text{ days}} \\ &= C_s \times 2.09 \text{E-}8 \text{ mg/kg-day} \end{aligned}$$

Where C_s for arsenic = 13.8 mg/kg

$$= 13.8 \times 2.09 \text{E-}8 \text{ mg/kg-day} = 2.89 \text{E-}7 \text{ mg/kg-day}$$

Carcinogenic and Noncarcinogenic Risk is then calculated:

$$\begin{aligned} \text{Incremental Cancer Risk (ICR)} &= \text{Carcinogenic Intake (mg/kg-day)} \times \text{Cancer Slope Factor (CSF)} \\ &\quad (\text{unitless}) \quad (\text{mg/kg-day}) \quad (\text{kg-day/mg}) \end{aligned}$$

$$\begin{aligned} \text{Hazard Quotient (HQ)} &= \frac{\text{Noncarcinogenic Intake (mg/kg-day)}}{\text{Reference Dose (RfD)}} \\ &\quad (\text{unitless}) \quad (\text{mg/kg-day}) \quad (\text{mg/kg-day}) \end{aligned}$$

Risks are calculated for arsenic where the $\text{CSF} = 1.5 \text{E+}0 \text{ kg-day/mg}$ and the $\text{RfD} = 3.0 \text{E-}4 \text{ mg/kg-day}$

$$\text{ICR}_{\text{arsenic}} = 2.89 \text{E-}7 \text{ mg/kg-day} \times 1.5 \text{E+}0 \text{ kg-day/mg} = 4.33 \text{E-}7$$

$$\text{HQ}_{\text{arsenic}} = \frac{8.11 \text{E-}5 \text{ mg/kg-day}}{3.0 \text{E-}4 \text{ mg/kg-day}} = 2.7 \text{E-}1$$

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for Major Construction Worker via		
BASED ON	RAGs	EPA, 1989	DRAWING NUMBER
BY	KAC	CHECKED BY	RJJ
APPROVED BY			DATE
		8/18/98	

References

USEPA 1989, "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation manual, PART A, Interim Final," EPA/540/1-89/002, EPA Office of Emergency and Remedial Response, Washington DC.

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker		
BASED ON	RAGs	EPA, 1989	DRAWING NUMBER
BY	KAC	CHECKED BY	RJJ
		APPROVED BY	DATE
			8/18/98

Purpose: To calculate carcinogenic and noncarcinogenic risk for the major construction worker via ... subchronic dermal contact with soil.

Equation:

$$\text{Intake (mg/kg-day)} = \frac{C_s \times C_F \times SA \times AF \times ABS \times EF}{BW \times AT}$$

Where:

C_s = Chemical Concentration in soil (mg/kg)	Chemical-Specific
C_F = Conversion Factor (kg/mg)	$1.00E-6$
SA = Skin Surface Area (cm ²)	4900
AF = Skin Adherence Factor (mg/cm ²)	0.3
ABS = Absorption Factor (unitless)	Chemical-Specific
EF = Exposure Frequency (days)	78
BW = Body Weight (kg)	70
AT_N = Averaging Time noncarcinogen (days)	91
AT_C = Averaging Time carcinogen (days)	25550

$$\text{Noncarcinogenic Intake (mg/kg-day)} = \frac{C_s \left(\frac{\text{mg}}{\text{kg}}\right) \times 1E-6 \left(\frac{\text{kg}}{\text{mg}}\right) \times 4900 \text{ cm}^2 \times 0.3 \text{ mg/cm}^2 \times ABS \times 78 \text{ days}}{70 \text{ kg} \times 91 \text{ days}}$$

$$= C_s \times ABS \times 1.8E-5 \text{ mg/kg-day}$$

Where C_s for arsenic = 13.8 mg/kg and ABS = 0.03

$$= 13.8 \times 0.03 \times 1.8E-5 \text{ mg/kg-day} = 7.45E-6 \text{ mg/kg-day}$$

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker via Dermal			
BASIS ON	RAGs	EPA, 1989	DRAWING NUMBER	Contact with Soil
BY	KAC	CHECKED BY	RJJ	APPROVED BY
				DATE
				8/16/98

$$\begin{aligned} \text{Carcinogenic Intake (mg/kg-day)} &= \frac{C_s \left(\frac{\text{mg}}{\text{kg}} \right) \times 10^{-6} \left(\frac{\text{kg}}{\text{mg}} \right) \times 4900 \text{ cm}^2 \times 0.3 \left(\frac{\text{mg}}{\text{cm}^2} \right) \times \text{ABS} \times 78 \text{ day}}{70 \text{ kg} \times 25550 \text{ days}} \\ &= C_s \times \text{ABS} \times 6.41 \text{ E-8 mg/kg-day} \end{aligned}$$

where C_s for Arsenic = 13.8 mg/kg

$$= 13.8 \times 0.03 \times 6.41 \text{ E-8 mg/kg-day} = \boxed{2.65 \text{ E-8 mg/kg-day}}$$

Carcinogenic and Noncarcinogenic Risks are then Calculated

$$\begin{aligned} \text{Incremental Cancer Risk (unitless)} &= \frac{\text{Carcinogenic Intake (mg/kg-day)}}{\text{Reference Dose (mg/kg-day)}} \times \text{Cancer Slope Factor dermal (kg-day/mg)} \\ \text{ICR} &= \frac{\text{mg/kg-day}}{\text{mg/kg-day}} \times \frac{\text{kg-day/mg}}{\text{kg-day/mg}} \end{aligned}$$

$$\begin{aligned} \text{Hazard Quotient (unitless)} &= \frac{\text{Noncarcinogenic Intake (mg/kg-day)}}{\text{Reference Dose dermal (mg/kg-day)}} \\ \text{HQ} &= \frac{\text{mg/kg-day}}{\text{mg/kg-day}} \end{aligned}$$

Risks are calculated for Arsenic where the $\text{CSF}_d = 1.7 \text{ E+0 kg-day/mg}$ and the $\text{RfD}_d = 2.7 \text{ E-4 mg/kg-day}$

$$\text{ICR}_{\text{Arsenic}} = 2.65 \text{ E-8 mg/kg-day} \times 1.7 \text{ E+0 kg-day/mg} = \boxed{4.5 \text{ E-8}}$$

$$\text{HQ}_{\text{Arsenic}} = \frac{7.45 \text{ E-6 mg/kg-day}}{2.7 \text{ E-4 mg/kg-day}} = \boxed{2.76 \text{ E-2}}$$

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for Two Major Construction Workers via		
BASED ON	RAGs	EPA 1989	DRAWING NUMBER
BY	KAC	CHECKED BY	RJJ
		APPROVED BY	DATE
			8/18/98

References

USEPA 1989, "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation Manual, Part A, Interim Final," EPA/540/1-89/002, EPA Office of Emergency and Remedial Response, Washington DC

USEPA 1992, "Dermal Exposure Assessment: Principles and Applications, Interim Report," EPA/600/8-91/011B, EPA Office of Research and Development, Washington DC

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Volatilization Factor			
BASED ON	Soil Screening Guidance		DRAWING NUMBER	
BY	KAC	CHECKED BY	RJJ	APPROVED BY
			DATE	8/18/98

Purpose: To calculate the soil to air volatilization factor for chemicals detected in soil

Equations:

$$VF = \left(\frac{Q}{C} \right) \times \left[\frac{(3.14 \times D_A \times T)^{0.5}}{(2 \times B \times D_A)} \right] \times 10^{-4} (\text{m}^2/\text{cm}^3)$$

Where:

$$D_A (\text{cm}^2/\text{s}) = \frac{\left(P_a^{1/3} \times D_i \times H' \right) + \left(P_w^{1/3} \times D_w \right)}{B \times K_d + P_w + P_a \times H'}$$

	Major Construction Worker	Minor Construction Worker
VF = Volatilization Factor (m^3/kg)	calculated	calculated
Q/C = Inverse of mean concentration at the center of source ($\text{g}/\text{m}^2\text{-s}/\text{kg}/\text{m}^3$)	46	61.03
Pw = Water filled soil porosity = $C_m \times B$	0.15	0.15
Pa = Air filled soil porosity = $P_t - P_w$	0.28	0.28
Pt = Total Soil Porosity = $1 - (B/P_s)$	0.43	0.43
Cm = Soil moisture Content ($\text{cm}^3\text{-water}/\text{g-soil}$)	0.1	0.1
B = Dry Soil Bulk Density (g/cm^3)	1.5	1.5
Ps = Soil Particle Density (g/cm^3)	2.65	2.65
Di = Diffusivity in air (cm^2/s)	Chem	chem
Dw = Diffusivity in water (cm^2/s)	Chem	chem
H = Henry's Constant ($\text{atm-m}^3/\text{mol}$)	Chem	chem
H' = dimensionless Henry's Constant = $H \times 41$	Chem	chem
Kd = Soil-water partition Coefficient (cm^3/g) = $K_{oc} \times C_c$	Chem	chem
Koc = Organic Carbon partition Coefficient (cm^3/g)	Chem	chem
Cc = Organic Carbon Content of soil	0.005	0.005
T = Exposure Interval	7.86E6	7.86E6
DA = Apparent Diffusivity (cm^2/s)	calc.	calc.

CLIENT	NIROP Fridley		JOB NUMBER	6966	
SUBJECT	Calculation of Volatilization Factor				
BASED ON	Soil Screening Guidance		DRAWING NUMBER		
BY	KAC	CHECKED BY	RJJ	APPROVED BY	DATE 8/18/98

For the major construction worker the VF for Trichloroethene (TCE) is calculated where:

$$D_1 = \text{TCE} = 8.10\text{E-}2 \text{ cm}^2/\text{s}$$

$$D_N = \text{TCE} = 9.10\text{E-}6 \text{ cm}^2/\text{s}$$

$$H = \text{TCE} = 8.90\text{E-}3 \text{ atm-m}^3/\text{mol}$$

$$H' = H \times 41 = \text{TCE} = 8.90\text{E-}3 \times 41 = 0.3649$$

$$K_d = K_{oc} \times O_c = \text{TCE} = 1.30\text{E+}2 \times 0.005 = 0.65 \text{ cm}^3/\text{g}$$

$$K_{oc} = \text{TCE} = 1.30\text{E+}2 \text{ cm}^3/\text{g}$$

$$D_A = \frac{[(0.28^{1/3} \times 8.1\text{E-}2 \frac{\text{cm}^2}{\text{s}} \times 0.3649) + (0.15^{1/3} \times 9.1\text{E-}6 \frac{\text{cm}^2}{\text{s}})]}{0.43^2}$$

$$= \frac{1.5 \text{ g/cm}^3 \times 0.65 \text{ cm}^3/\text{g} + 0.15 + 0.28 \times 0.3649}{1.87\text{E-}3 \text{ cm}^2/\text{s}}$$

and then the VF for TCE is calculated

$$\text{VF TCE} = \left(\frac{46 \text{ g/m}^3 \cdot \text{s}}{\text{kg/m}^3} \right) \times \left[\frac{(3.14 \times 1.87\text{E-}3 \text{ cm}^2/\text{s} \times 7.86\text{E+}6)^{0.5}}{(2 \times 1.5 \text{ g/cm}^3 \times 1.87\text{E-}3 \text{ cm}^2/\text{s})} \right] \times 10^{-4} \text{ m}^2/\text{cm}^2$$

$$= 1.76\text{E+}2 \text{ m}^3/\text{kg}$$

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Volatilization Factor			
BASED ON	Soil Screening Guidance		DRAWING NUMBER	
BY	KAC	CHECKED BY	RJS	APPROVED BY
				DATE 8/18/98

For the minor construction worker the VF for Trichloroethene (TCE) is calculated:

$$D_i = \text{TCE} = 8.1 \text{E-}2 \text{ cm}^2/\text{s}$$

$$D_w = \text{TCE} = 9.1 \text{E-}6 \text{ cm}^2/\text{s}$$

$$H = \text{TCE} = 8.9 \text{E-}3 \text{ atm-m}^3/\text{mol}$$

$$H' = H \times 41 = \text{TCE} = 8.9 \text{E-}3 \times 41 = 0.3649$$

$$K_d = K_{oc} \times OC = \text{TCE} = 1.30 \text{E+}2 \times 0.005 = 0.65 \text{ cm}^3/\text{g}$$

$$K_{oc} = \text{TCE} = 1.3 \text{E+}2 \text{ cm}^3/\text{g}$$

$$D_A = \frac{(0.28^{1/3} \times 8.1 \text{E-}2 \frac{\text{cm}^2}{\text{s}} \times 0.3649) + (0.15^{1/3} \times 9.1 \text{E-}6 \frac{\text{cm}^2}{\text{s}})}{0.432}$$

$$= \frac{1.5 \text{ g/cm}^3 \times 0.65 \text{ cm}^3/\text{g} + 0.15 + 0.28 \times 0.3649}{1.87 \text{E-}3 \text{ cm}^2/\text{s}}$$

And then the VF for TCE in the minor construction worker is calculated

$$VF_{\text{TCE}} (\text{m}^3/\text{kg}) = \left[\frac{61.03 (\text{g/m}^2 \cdot \text{s})}{(\text{Kg/m}^2)} \right] \times \left[\frac{(3.14 \times 1.87 \text{E-}3 \text{ cm}^2/\text{s} \times 7.88 \text{E+}8)^{0.5}}{(2 \times 1.5 \text{ g/cm}^3 \times 1.87 \text{E-}3 \text{ cm}^2/\text{s})} \right] \times 10^{-4} \frac{\text{m}^2}{\text{cm}^2}$$

$$= 2.34 \text{E+}3 \text{ m}^3/\text{kg}$$

Reference

USEPA April 1996, "Soil Screening Guidance: User's Guide," Office of Solid Waste and Emergency Response, Washington DC.
EPA/540/R-96/018

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker in			
BASED ON	RAGs and Soil Screening Guidance		DRAWING NUMBER	Inhalation of Soil Particulate
BY	KAC	CHECKED BY	RJ J	APPROVED BY
				DATE 8/18/98

Purpose: To Calculate Carcinogenic and noncarcinogenic risk associated with ^{Subchronic} Inhalation of soil particulate.

Equations:

$$\text{Noncarcinogenic Intake (mg/m}^3\text{)} = \frac{C_s \times \left(\frac{1}{VF} + \frac{1}{PEF} \right) \times EF}{ATN}$$

$$\text{Carcinogenic Intake (mg/m}^3\text{)} = \frac{C_s \times \left(\frac{1}{VF} + \frac{1}{PEF} \right) \times EF \times ED \times 1000 \mu\text{g/mg}}{ATC}$$

Where:

C_s = Chemical Concentration in soil (mg/kg)	Chemical specific
$1/VF$ = Inverse of Volatilization Factor (kg/m^3)	Chemical specific
$1/PEF$ = Inverse of the particulate emission factor (kg/m^3)	$4.00E-8$
EF = Exposure Frequency (days)	78
ED = Exposure Duration (years)	1
ATN = Averaging Time noncarcinogenic (days)	91
ATC = Averaging Time carcinogens (days)	25,550

Calculations will be performed for Trichloroethene (TCE) where the VF for the Major Construction worker exposed to TCE in soil = $1.76E+2 \text{ m}^3/\text{kg}$. And the concentration of TCE in soil = 1.1 mg/kg

$$\begin{aligned} \text{Noncarcinogenic Intake} &= \frac{1.1 \frac{\text{mg}}{\text{kg}} \times \left(\frac{1}{1.76E+2 \text{ m}^3/\text{kg}} + 4.00E-8 \text{ kg/m}^3 \right) \times 78 \text{ days}}{91 \text{ days}} \\ &= \boxed{5.36E-3 \text{ mg/m}^3} \end{aligned}$$

CLIENT	NIROP Fridley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker via			
BASED ON	RAGs and Soil Screening Guidance		DRAWING NUMBER	Anhalation of Soil Particulate
BY	KAC	CHECKED BY	RJJ	APPROVED BY
				DATE 8/18/98

$$\text{Carcinogenic Intake} = \frac{1.1 \frac{\text{mg}}{\text{kg}} \times \left(\frac{1}{1.76 \text{E}+2 \text{ m}^3/\text{kg}} + 4.0 \text{E}-8 \frac{\text{kg}}{\text{m}^3} \right) \times 78 \text{ days} \times 141 \times 1000}{25550 \text{ days}} \mu\text{g}/\text{m}^3 \text{ TCE}$$

$$= \boxed{1.91 \text{E}-2 \mu\text{g}/\text{m}^3}$$

Carcinogenic and Noncarcinogenic Risk is then calculated

$$\text{Incremental Cancer Risk} = \frac{\text{ICR}}{\text{unitless}} = \frac{\text{Carcinogenic Intake}}{\mu\text{g}/\text{m}^3} \times \frac{\text{Anhalation Unit Risk}}{(\mu\text{g}/\text{m}^3)^{-1}}$$

$$\text{Hazard Quotient} = \frac{\text{HQ}}{\text{unitless}} = \frac{\text{Noncarcinogenic Intake}}{\text{mg}/\text{m}^3} \times \frac{\text{Anhalation Reference Concentration}}{\text{mg}/\text{m}^3}$$

Risks are then calculated for TCE where the Anhalation Unit Risk = $1.7 \text{E}-6 (\mu\text{g}/\text{m}^3)^{-1}$ and the Reference Concentration = $5.0 \text{E}-1 \text{ mg}/\text{m}^3$

$$\frac{\text{ICR}}{\text{TCE}} = 1.91 \text{E}-2 \mu\text{g}/\text{m}^3 \times 1.7 \text{E}-6 (\mu\text{g}/\text{m}^3)^{-1} = \boxed{3.25 \text{E}-8}$$

$$\frac{\text{HQ}}{\text{TCE}} = \frac{5.36 \text{E}-3 \text{ mg}/\text{m}^3}{5.0 \text{E}-1 \text{ mg}/\text{m}^3} = \boxed{1.072 \text{E}-2}$$

References

USEPA 1989, "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation Manual, Part A, Interim Final", EPA/540/1-89/002 OERR, Washington D.C.

USEPA April 1996, "Soil Screening Guidance: User's Guide", OSWER Washington DC EPA/546/R-96/018

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Minor Construction Worker Via		
BASED ON	RAGS	DRAWING NUMBER	Soil Ingestion
BY	KAC	CHECKED BY	RJJ
APPROVED BY		DATE	8/18/98

Purpose: To calculate carcinogenic and noncarcinogenic risk for the minor construction worker via chronic ingestion of chemicals in soil.

Equation:

$$\text{Intake (mg/kg-day)} = \frac{C_s \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where:

C_s = Concentration of chemical in soil (mg/kg)	chemical specific
IR = Ingestion Rate (mg/soil/day)	200
CF = Conversion Factor (kg/mg)	$1.0E-6$
FI = Fraction Ingested (unitless)	1.0
EF = Exposure Frequency (days)	80
ED = Exposure Duration (years)	25
BW = Body Weight (kg)	70
ATN = Averaging Time noncarcinogens (days)	9125
ATC = Averaging Time carcinogens (days)	25550

$$\begin{aligned} \text{Noncarcinogenic Intake (mg/kg-day)} &= \frac{C_s \frac{\text{mg}}{\text{kg}} \times 200 \frac{\text{mg}}{\text{day}} \times 1.0E-6 \frac{\text{kg}}{\text{mg}} \times 1.0 \times 80 \text{ days} \times 25 \text{ years}}{70 \text{ kg} \times 9125 \text{ days}} \\ &= C_s \times 6.26E-7 \text{ mg/kg-day} \end{aligned}$$

$$\begin{aligned} \text{Where the concentration of Arsenic in soil } C_{s\text{Arsenic}} &= 3.08 \text{ mg/kg} \\ &= 3.08 \times 6.26E-7 \text{ mg/kg-day} \\ &= \boxed{1.93E-6 \text{ mg/kg-day}} \end{aligned}$$

CLIENT	NIROP Fridley		JOB NUMBER	6966	
SUBJECT	Calculation of Intake and Risk for the Minor Construction Worker via				
BASED ON	RAGs		DRAWING NUMBER	Soil Arsenic	
BY	KAC	CHECKED BY	RJS	APPROVED BY	DATE 8/18/98

$$\text{Carcinogenic Intake (mg/Kg-day)} = \frac{C_s \text{ mg/Kg} \times 200 \text{ mg/day} \times 1 \text{E-6 kg/mg} \times 1.0 \times 8 \text{ days} \times 25 \text{ years}}{70 \text{ Kg} \times 25550 \text{ days}}$$

$$= C_s \times 2.24 \text{E-7 mg/Kg-day}$$

where the concentration of Arsenic in soil = $C_s \text{ Arsenic} = 3.08 \text{ mg/Kg}$

$$= 3.08 \times 2.24 \text{E-7 mg/Kg-day}$$

$$= \boxed{6.89 \text{E-7 mg/Kg-day}}$$

Carcinogenic and Noncarcinogenic Risk is then calculated:

$$\text{Incremental Cancer Risk (ICR)} = \frac{\text{Carcinogenic Intake (mg/Kg-day)}}{\text{CSF}_0 \text{ (Kg-day/mg)}}$$

unitless

$$\text{Hazard Quotient (HQ)} = \frac{\text{Noncarcinogenic Intake (mg/Kg-day)}}{\text{Reference Dose oral (RfDo) (mg/Kg-day)}}$$

unitless

Risks are calculated for Arsenic where the $\text{CSF}_0 = 1.5 \text{E+0 Kg-day/mg}$ and the ~~RfDo~~ $\text{RfDo} = 3.0 \text{E-4 mg/Kg-day}$.

$$\text{ICR Arsenic} = 6.89 \text{E-7 mg/Kg-day} \times 1.5 \text{ Kg-day/mg} = \boxed{1.033 \text{E-6}}$$

$$\text{HQ Arsenic} = \frac{1.93 \text{E-6 mg/Kg-day}}{3.0 \text{E-4 mg/Kg-day}} = \boxed{6.43 \text{E-3}}$$

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for Manual Construction Worker II.		
BASIS ON	RAGs	ETA, 1989	DRAWING NUMBER
BY	KACU	CHECKED BY	APPROVED BY
		RJJ	DATE
			8/18/98

References

USEPA 1989, "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation manual, PART A, Interim Final," EPA/540/1-89/002, EPA Office of Emergency and Remedial Response, Washington DC.

CLIENT	NIRDP Findley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Minor Construction Worker via		
BASED ON	RAGS EPA 1989	DRAWING NUMBER	Dermal Contact with Soil
BY	KAC	CHECKED BY	RJS
APPROVED BY		DATE	8/18/98

Purpose: To calculate carcinogenic and noncarcinogenic risk for the minor construction worker via chronic dermal contact with soil.

Equation:

$$\text{Intake (mg/kg-day)} = \frac{C_s \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

C_s = Chemical Concentration in Soil (mg/kg)	Chemical-specific
CF = Conversion Factor (kg/mg)	$1.0E-6$
SA = Skin Surface Area (cm ²)	4900
AF = Skin Adherence Factor (mg/cm ²)	0.3
ABS = Absorption Factor (unitless)	Chemical-specific
EF = Exposure Frequency (days)	80
ED = Exposure Duration (years)	25
BW = Body Weight (kg)	70
AT_N = Averaging Time noncarcinogen (day)	9125
AT_C = Averaging Time carcinogen (day)	25550

$$\text{Noncarcinogenic Intake (mg/kg-day)} = \frac{C_s \text{ mg/kg} \times 1E-6 \frac{\text{kg}}{\text{mg}} \times 4900 \text{ cm}^2 \times 0.3 \text{ mg/cm}^2 \times ABS \times 80 \text{ days} \times 25 \text{ yrs}}{70 \text{ kg} \times 9125 \text{ days}}$$

$$= C_s \times ABS \times 4.6E-6 \text{ mg/kg-day}$$

where the concentration of Arsenic in soil = C_s Arsenic = 3.08 mg/kg
and the ABS for As = 0.03

$$= 3.08 \times 0.03 \times 4.6E-6 \text{ mg/kg-day} = \boxed{4.25E-7 \text{ mg/kg-day}}$$

CLIENT	NIROP Fridley	JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Major Construction Worker via		
BASIS ON	RAGs	DRAWING NUMBER	Dermal Contact with Soil
BY	KAC	CHECKED BY	RJJ
		APPROVED BY	DATE 8/18/98

References

USEPA 1989, "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation Manual, Part A, Interim Final," EPA/540/1-89/002, EPA Office of Emergency and Remedial Response, Washington DC

USEPA 1992, "Dermal Exposure Assessment: Principles and Applications, Interim Report," EPA/600/8-91/011B, EPA Office of Research and Development, Washington DC

CLIENT	NIROP Fridley		JOB NUMBER	6966	
SUBJECT	Calculation of Intake and Risk for the Minor Construction Worker Via				
BASED ON	RABs and Soil Screening Guidance		DRAWING NUMBER	Amhalation of Soil Particulate	
BY	KAC	CHECKED BY	RJJ	APPROVED BY	DATE 8/16/98

Purpose: To calculate carcinogenic and noncarcinogenic risk associated with chronic inhalation of soil particulate

Equation:

$$\text{Noncarcinogenic Intake (mg/m}^3\text{)} = \frac{C_s \times \left(\frac{1}{VF} + \frac{1}{PEF} \right) \times EF \times ED}{AT_N}$$

$$\text{Carcinogenic Intake (ug/m}^3\text{)} = \frac{C_s \times \left(\frac{1}{VF} + \frac{1}{PEF} \right) \times EF \times ED \times 1000 \text{ ug/mg}}{AT_C}$$

Where:

C_s = Chemical Concentration in soil (mg/kg)	Chemical Specific
$1/VF$ = Inverse of Volatilization Factor (kg/m^3)	Chemical Specific
$1/PEF$ = Inverse of Particulate Emission Factor (kg/m^3)	$2.6098 \text{E}-9$
EF = Exposure Frequency (days)	80
ED = Exposure Duration (years)	25
AT_N = Averaging Time (noncarcinogen) (days)	9125
AT_C = Averaging Time (carcinogen) (days)	25550

Calculations will be performed for trichloroethene (TCE) where the VF for the minor construction worker exposed to TCE in soil = $2.34 \text{E}+3 \text{ m}^3/\text{kg}$ and the concentration of TCE in soil = ~~0.0824~~ 0.0824 mg/kg .

$$\text{Noncarcinogenic Intake (mg/m}^3\text{)} = \frac{0.0824 \text{ mg/kg} \times \left(\frac{1}{2.34 \text{E}+3 \text{ m}^3/\text{kg}} + 2.6098 \text{E}-9 \frac{\text{kg}}{\text{m}^3} \right) \times 80 \text{ day} \times 25 \text{ yr}}{9125 \text{ days}}$$

TCE

=

$$7.72 \text{E}-6 \text{ mg/m}^3$$

CLIENT	NIROP Fudley		JOB NUMBER	6966
SUBJECT	Calculation of Intake and Risk for the Manor Construction Worker via			
BASED ON	RAGs and Soil Screening Guidance		DRAWING NUMBER	Amhalation of Soil Particulate
BY	KAC	CHECKED BY	RJS	APPROVED BY
				DATE 8/18/98

$$\text{Carcinogenic Intake } \mu\text{g}/\text{m}^3 \text{ TCE} = \frac{0.0824 \frac{\text{mg}}{\text{kg}} \times \left(\frac{1}{2.34 \times 10^3} \frac{\text{m}^3}{\text{kg}} + 2.6098 \times 10^{-9} \frac{\text{kg}}{\text{m}^3} \right) \times 80 \text{ day} \times 254 \times 1000 \mu\text{g}/\text{mg}}{25550 \text{ days}}$$

$$= \boxed{2.76 \times 10^{-3} \mu\text{g}/\text{m}^3}$$

Carcinogenic and Noncarcinogenic Risk is then Calculated

$$\text{Incremental Cancer Risk} = \frac{\text{Carcinogenic Intake } \mu\text{g}/\text{m}^3}{\text{unitless}} \times \frac{\text{Amhalation unit Risk } (\mu\text{g}/\text{m}^3)^{-1}}{(\mu\text{g}/\text{m}^3)^{-1}}$$

$$\text{Hazard Quotient} = \frac{\text{Noncarcinogenic Intake } \mu\text{g}/\text{m}^3}{\text{Amhalation Reference Concentration } \mu\text{g}/\text{m}^3}$$

HQ unitless

Risks are then calculated for TCE where the Amhalation unit Risk = $1.7 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$ and the Reference Concentration = Not available.

$$\text{ICR}_{\text{TCE}} = 2.76 \times 10^{-3} \mu\text{g}/\text{m}^3 \times 1.7 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1} = \boxed{4.69 \times 10^{-9}}$$

The Hazard Quotient cannot be calculated as a chronic Reference Concentration was not available for TCE.

References

USEPA 1989 "Risk Assessment Guidance (RAGs) for Superfund: Human Health Evaluation Manual, Part A, Interim Final," EPA/540/1-89/002 OERR

USEPA April 1996, "Soil Screening Guidance: User's Guide," OSWER EPA/540/R-96/018

APPENDIX G.8
SCREENING EVALUATION FOR EXPOSURES TO
SURFACE AND SUBSURFACE SOIL (0 TO 12 FEET)
INDUSTRIAL WORKERS AND
MINOR FREQUENT CONSTRUCTION WORKERS

INDUSTRIAL WORKERS

October 1997 Working Draft Tier II Generic -- Industrial Human Health-Based Soil Reference Values (SRV)

Maximum Detected Concentration in Surface and Subsurface Soil (0 to 12 feet)

NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).

If multiple contaminants are present cumulative risk MUST be evaluated. Soil reference values may not be protective of impacts to ecological receptors and to ground water. Impacts to ecological receptors and/or ground water must be evaluated by utilizing other methods.

Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ / SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR / SRV).

Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.

Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).

Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical	CAS No.	Industrial SRV (mg/kg)	Site Conc. (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)													CANCER (RISK per 100,000) (1)			
					ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID			WHOLE BODY	
Inorganics:																					
Aluminum	7429-90-5	100000	22.0	0.002	b			0.002						0.002					NA	NA	
Antimony	7440-36-0	100		0.000			0.000										0.000		NA	NA	
Arsenic	7440-38-2	22	8.24	0.003			0.003	0.003							0.003				4.27E-07	A	
Barium	7440-39-3	12500	34.7	0.001			0.001							0.001					NA	NA	
Beryllium	7440-41-7	7		0.000															0.00E+00	B2	
Boron	7440-42-8	23000		0.000										0.000	0.000				NA	D	
Cadmium	7440-43-9	150		0.000						0.000									0.00E+00	c B1	
Chromium III	18065-83-1	100000		0.000	b														NA	NA	
Chromium VI	18540-29-9	155	618	0.797															3.99E-06	c A	
Cobalt	7440-48-4	13000	2.2	0.000			0.000			0.000					0.000				NA	D	
Copper	7440-50-8	9000	64.3	0.001	b							0.001							NA	D	
Cyanide, free	57-12-5	5000	140	0.006	b			0.006										0.006	0.006	NA	NA
Lead	7439-92-1	700	231	0.330		Based on blood lead levels. HQ > 1 blood lead levels may exceed 10 ug/dl.														NA	B2
Manganese	7439-96-5	3200	104	0.006				0.006												NA	D
Mercury (methyl mercury)	22967-92-6	22		0.000				0.000						0.000						NA	NA
Mercury (inorganic; elemental and mercuric chloride)	7439-97-6/7487-94-7	2		0.000				0.000		0.000										NA	D
Nickel	various	3000	15.3	0.001	b													0.001	1.73E-09	c A	
Selenium	7782-49-2	1250		0.000	b		0.000	0.000				0.000			0.000					NA	D
Silver	7440-22-4	1250		0.000	b										0.000					NA	D
Thallium	various	21		0.000	b		0.000							0.000						NA	D
Tin		100000		0.000	b					0.000	0.000									NA	D
Vanadium	7440-62-2/13	1300	7.2	0.001	b															NA	D
Zinc	7440-68-6	70000	22.5	0.000	b		0.000													NA	D
Volatile Organics																					
Acetone	v 67-64-1	16000		0.000				0.000			0.000	0.000								NA	D
Benzene	v 71-43-2	4		0.000	c		0.000													0.00E+00	A
Bromodichloromethane	v 75-27-4	5		0.000							0.000									0.00E+00	B2
Bromomethane (methyl bromide)	v 74-83-9	3.5		0.000								0.000			0.000					NA	D
1,3 - Butadiene	v 106-99-0	0.1		NA																0.00E+00	c B2
n-Butylbenzene	v 104-51-8	182		0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
sec-Butylbenzene	v 135-98-8	234		0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
tert-Butylbenzene (surrogate - n-butylbenzene)	v 98-06-6	182		0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
Butyl benzylphthalate	v 85-68-7	37000		0.000								0.000								NA	C
Carbon Disulfide	v 75-15-0	255		0.000	b			0.000							0.000					NA	NA
Carbon Tetrachloride	v 56-23-5	0.8		0.000								0.000								0.00E+00	B2
Chlorobenzene	v 108-90-7	32		0.000							0.000	0.000								NA	D
Chloroethane (ethyl chloride)	v 75-00-3	1484		0.000		Csat utilized														NA	NA
Chloroform (trichloromethane)	v 67-66-3	4		0.000								0.000								0.00E+00	B2
Chloromethane (methyl chloride)	v 74-87-3	21		NA																0.00E+00	C
2-Chlorotoluene	v 95-49-8	436		0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
Cumene (isopropylbenzene)	v 98-82-8	187		0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
1,2 - Dibromomethane (ethylene dibromide)	v 106-93-4	0.25		0.000	c									0.000						0.00E+00	B2
Dibromomethane (methylene bromide)	v 74-95-3	1800		0.000			0.000													NA	NA

October 1997 Working Draft Tier II Generic - - Industrial Human Health-Based Soil Reference Values (SRV)

Maximum Detected Concentration in Surface and Subsurface Soil (0 to 12 feet)

NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).

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Screening Risk Evaluation based on Industrial Land Use Exposure Scenario

Chemical		CAS No.	Industrial SRV (mg/kg)	Site Concentration (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)														CANCER (RISK per 100,000) (1)	
						ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY		
Dichlorodifluoromethane (Freon 12)	v	75-71-8	50	0.000	0.000						0.000							0.000	NA	NA	
1,1 - Dichloroethane	v	75-34-3	50		0.000						0.000								0.00E+00	C	
1,2 - Dichloroethane	v	107-06-2	5		0.000	c													0.00E+00	B2	
1,1 - Dichloroethylene	v	75-35-4	0.7		0.000							0.000							0.00E+00	C	
cis - 1,2 - Dichloroethylene	v	154-59-2	2200		0.000		0.000												NA	D	
trans - 1,2 - Dichloroethylene	v	156-60-5	425		0.000							0.000							NA	D	
1,2 - Dichloroethylene (mixed isomers)	v	540-59-0	380		0.000							0.000							NA	D	
Dichloromethane (methylene chloride)	v	75-09-2	150		0.000							0.000							0.00E+00	B2	
1,2 - Dichloropropane	v	78-87-5	15		0.000										0.000				0.00E+00	B2	
Ethyl benzene		100-41-4	190		0.000	Csat utilized					0.000	0.000		0.000					NA	D	
Methyl ethyl ketone (2-butanone)	v	78-93-3	4300		0.000									0.000					NA	D	
Methyl isobutyl ketone (MIBK)	v	108-10-1	420		0.000						0.000	0.000						0.000	NA	NA	
Naphthalene	v	91-20-3	5.5		0.003		0.003		0.003						0.003				NA	D	
n-Propylbenzene (surrogate - Cumene)	v	103-85-1	187		0.000	Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA
Styrene	v	100-42-5	350		0.000		0.000	0.000				0.000							0.00E+00	B2	
1,1,1,2 - Tetrachloroethane	v	630-20-6	42		0.000						0.000	0.000							0.00E+00	C	
1,1,2,2 - Tetrachloroethane	v	78-34-5	8.5		0.000							0.000					0.000		0.00E+00	C	
Tetrachloroethylene (PCE)	v	127-18-4	320		0.000			0.000			0.000	0.000							1.66E-08	B2/C	
Toluene	v	108-88-3	420		0.000			0.000			0.000	0.000			0.000				NA	D	
1,2,4 - Trichlorobenzene	v	120-82-1	1120		0.000	0.000						0.000							NA	D	
1,1,1 - Trichloroethane	v	71-55-6	854	0.000	Csat Utilized		0.000				0.000							NA	D		
1,1,2 - Trichloroethane	v	79-00-5	11	0.000		0.000			0.000		0.000							8.18E-09	C		
Trichloroethylene (TCE)	v	79-01-6	55	NA														1.40E-07	B2/C		
Trichlorofluoromethane	v	75-69-4	200	0.000													0.000	NA	NA		
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		76-13-1	1485	0.000	Csat utilized. If > 1 indicates potential for free product in soil.														NA	NA	
1,2,4-Trimethylbenzene	v	95-63-6	27	0.000			0.000			0.000	0.000						0.000	NA	NA		
1,3,5-Trimethylbenzene	v	108-67-8	11.5	0.000			0.000			0.000	0.000						0.000	NA	NA		
Vinyl chloride	v	75-01-4	0.3	0.000							0.000							0.00E+00	A		
Xylenes (mixed)	v	1330-20-7	268	0.000	Csat Utilized		0.000							0.000			0.000	NA	D		
Non/Semi Volatile Organics																					
Benzyl alcohol		100-51-6	55250	0.000	b						0.000							NA	NA		
Bis (2 - chloroethyl) ether	v	111-44-4	0.8	NA														0.00E+00	B2		
Bis (chloromethyl) ether	v	542-88-1	0.0035	NA														0.00E+00	A		
Bromoform (tribromomethane)		75-25-2	3200	0.000	b						0.000							0.00E+00	B2		
Butyl benzylphthalate		85-68-7	37000	0.000	b						0.000							NA	C		
Dibenzofuran	v	132-64-9	120	0.001	Csat utilized. If > 1 indicates potential for free prod					0.001							NA	NA			
1,4 - Dibromobenzene		106-37-6	1760	0.000	b						0.000							NA	NA		
Dibromochloromethane		124-48-1	315	0.000	b						0.000							0.00E+00	b C		
Dibutyl phthalate		84-74-2	18400	0.000	b												0.000	NA	D		
1,2 - Dichlorobenzene	v	95-50-1	590	0.000													0.000	NA	D		
1,3 - Dichlorobenzene	v	541-73-1	575	0.000													0.000	NA	D		
1,4 - Dichlorobenzene	v	106-46-7	50	0.000	c					0.000	0.000							0.00E+00	C		
3,3' - Dichlorobenzidine		91-94-1	57	NA														0.00E+00	b B2		
2,4-Dichlorophenol		120-83-2	370	0.000	b				0.000									NA	NA		
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)		117-81-7	2100	0.000	b						0.000							2.10E-08	b B2		

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Maximum Detected Concentration in Surface and Subsurface Soil (0 to 12 feet)																			
NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).																			
If multiple contaminants are present cumulative risk MUST be evaluated. Soil reference values may not be protective of impacts to ecological receptors and to ground water. Impacts to ecological receptors and/or ground water must be evaluated by utilizing other methods.																			
Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ /SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR/SRV).																			
Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.																			
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).																			
Screening Risk Evaluation based on Industrial Land Use Exposure Scenario																			
Chemical	CAS No.	Industrial SRV (mg/kg)	Site Concentration (mg/kg)	Site HQ (1)	ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY	CANCER (RISK per 100,000) (1)
2,4-Dimethylphenol	105-67-9	4000	0.000	b		0.000	0.000												NA
Di-n-octyl phthalate	117-84-0	3700	0.000	b						0.000	0.000								NA
2-Methylphenol (o-cresol)	95-48-7	5800	0.000	b			0.000											0.000	NA
3-Methylphenol (m-cresol)	108-39-4	5800	0.000	b			0.000											0.000	NA
4-Methylphenol (p-cresol)	106-44-5	580	0.000	b			0.000							0.000					NA
N-Nitrosodiphenylamine	86-30-6	3000	NA																0.00E+00
N-Nitrosodi-N-propylamine	621-64-7	4	NA																0.00E+00
Pentachlorophenol	87-86-5	150	0.000							0.000	0.000								0.00E+00
Phenol	108-95-2	34000	0.000	b									0.000						NA
2,3,4,6-Tetrachlorophenol	58-90-2	3700	0.000								0.000								NA
2,4,5-Trichlorophenol	95-95-4	12000	0.000	b						0.000	0.000								NA
2,4,6-Trichlorophenol	88-06-2	1730	NA																0.00E+00
Polyaromatic Hydrocarbons																			
Acenaphthene	83-32-9	90	0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA
Anthracene	120-12-7	5	0.000		Csat utilized. If > 1 indicates potential for free product in soil.														NA
Benz[a]anthracene	56-55-3	35	NA																0.00E+00
Benzo[b]fluoranthene	205-99-2	35	NA																0.00E+00
Benzo[k]fluoranthene	207-08-9	350	NA																0.00E+00
Benzo[a]pyrene (or BaP equivalents)	50-32-8	3.5	NA																0.00E+00
Chrysene	218-01-9	3500	NA																0.00E+00
Dibenz[ah]anthracene	53-70-3	3.5	NA																0.00E+00
Fluoranthene	206-44-0	6400	0.000	b		0.000				0.000	0.000								NA
Fluorene	86-73-7	3564	0.000		Csat Utiliz														NA
Indeno[1,2,3-cd]pyrene	193-39-5	35	NA																0.00E+00
Naphthalene - see Volatile Organics																			
Pyrene	129-00-0	5300	0.000							0.000									NA
Quinoline	91-22-5	2	NA																0.00E+00
Polychlorinated Biphenyls																			
PCBs (Polychlorinated Biphenyls)	1336-36-3	3.5	0.000	b				0.000	0.000				0.000						0.00E+00
MDA Pesticides and Herbicides																			
Aldrin	309-00-2	2	0.000	b							0.000								0.00E+00
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	2200	0.000	b		0.000				0.000	0.000								NA
4-(2,4-Dichlorophenoxy) butyric acid (2,4-DB)	94-82-6	1750	0.000	b		0.000					0.000							0.000	NA
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	94-75-6	110	0.000	b						0.000	0.000								NA
2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP)	93-85-2	220	0.000	b						0.000									NA
Metolachlor	51218-45-2	33000	0.000	b														0.000	NA
Picloram	1919-02-1	15400	0.000	b							0.000								NA
Terbufos	13071-79-9	3	0.000	b			0.000												NA
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	2200	0.000	b						0.000			0.000						NA
Dioxins and Furans																			
2,3,7,8-TCDD (or 2,3,7,8-TCDD equivalents)	1746-01-6	0.00035	NA																0.00E+00
1,2,3,7,8-PeCDD	0	0.0007	NA																0.00E+00

October 1997 Working Draft Tier II Generic - - Industrial Human Health-Based Soil Reference Values (SRV)																			
Maximum Detected Concentration in Surface and Subsurface Soil (0 to 12 feet)																			
NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).																			
If multiple contaminants are present cumulative risk MUST be evaluated. Soil reference values may not be protective of impacts to ecological receptors and to ground water. Impacts to ecological receptors and/or ground water must be evaluated by utilizing other methods.																			
Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ / SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR / SRV).																			
Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.																			
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).																			
Screening Risk Evaluation based on Industrial Land Use Exposure Scenario																			
Chemical	CAS No.	Industrial SRV (mg/kg)	Site Concentration (mg/kg)	Site HQ (1)	ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY	CANCER (RISK per 100,000) (1)
1,2,3,4,7,8-HxCDD	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,6,7,8-HxCDD	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,7,8,9-HxCDD	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,4,6,7,8-HpCDD	0	0.035	NA	NA															0.00E+00 B2
1,2,3,4,6,7,8,9-OCDD	0	0.35	NA	NA															0.00E+00 B2
2,3,7,8-TCDF	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,7,8-PeCDF	0	0.007	NA	NA															0.00E+00 B2
2,3,4,7,8-PeCDF	0	0.0007	NA	NA															0.00E+00 B2
1,2,3,4,7,8-HxCDF	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,6,7,8-HxCDF	0	0.0035	NA	NA															0.00E+00 B2
2,3,4,6,7,8-HxCDF	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,7,8,9-HxCDF	0	0.0035	NA	NA															0.00E+00 B2
1,2,3,4,6,7,8-HpCDF	0	0.035	NA	NA															0.00E+00 B2
1,2,3,4,7,8,9-HpCDF	0	0.035	NA	NA															0.00E+00 B2
1,2,3,4,6,7,8,9-OCDF	0	0.35	NA	NA															0.00E+00 B2
Explosives																			
1,3 - DNB	99-85-0	12	0.000	b												0.000			NA D
2,4 - DNT	121-14-2	380	0.000	b		0.000	0.000				0.000								see mixture
2,6 - DNT	606-20-2	175	0.000	b		0.000	0.000			0.000	0.000								see mixture
2,4- AND 2,6 DNT MIXTURE		36	NA																0.00E+00 b B2
HMX	2691-41-0	9500	0.000	b							0.000								NA D
RDX	121-82-4	65	0.000	b								0.000							0.00E+00 b C
1,3,5 - TNB	99-35-4	6	0.000	b												0.000			NA NA
2,4,6 - TNT	118-96-7	60	0.000	b							0.000								0.00E+00 b C
Other Organics																			
Benzoic acid	65-85-0	100000	0.000	b	Soil Maximum Utilized														NA
Hexane	110-54-3	31	0.000				0.000						0.000	0.000					NA NA
Additional Pesticides and Herbicides																			
gamma-BHC (Lindane)	58-89-9	20	0.000	b						0.000	0.000								0.00E+00 b B2/C
Chloramben	133-90-4	3300	0.000								0.000								NA NA
Chlordane	57-74-9	13	0.000								0.000								0.00E+00 B2
4, 4' - DDD	75-54-8	125	NA																0.00E+00 b B2
4, 4' - DDE	72-55-9	88	NA																0.00E+00 b B2
4, 4' - DDT	50-29-3	88	0.000	b							0.000								0.00E+00 B2
Diazinon	333-41-5	200	0.000	b			0.000												NA NA
Dieldrin	60-57-1	2	0.000	b							0.000								0.00E+00 B2
Endosulfan	115-29-7	700	0.000	b		0.000	0.000			0.000									NA NA
Endrin	72-20-8	65	0.000	b			0.000				0.000								NA D
Heptachlor	76-44-8	7	0.000	b							0.000								0.00E+00 B2
Heptachlor epoxide	1024-57-3	3	0.000	b							0.000								0.00E+00 B2
Methoxychlor	72-43-5	690	0.000	b									0.000						NA D
Toxaphene	8001-35-2	28	NA																0.00E+00 B2

October 1997 Working Draft Tier II Generic - - Industrial Human Health-Based Soil Reference Values (SRV)																			
Maximum Detected Concentration in Surface and Subsurface Soil (0 to 12 feet)																			
NOTE: Based on LIMITED multiple pathway exposure scenario (i.e., incidental soil/dust ingestion, dermal contact and inhalation).																			
If multiple contaminants are present cumulative risk MUST be evaluated. Soil reference values may not be protective of impacts to ecological receptors and to ground water. Impacts to ecological receptors and/or ground water must be evaluated by utilizing other methods.																			
Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ /SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR/SRV).																			
Individual chemical specific HQ should not exceed 0.2 (see exceptions below, e.g. SRVs set at Csat), cumulative HI should not exceed 1 for each target endpoint.																			
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).																			
Screening Risk Evaluation based on Industrial Land Use Exposure Scenario																			
Chemical	CAS No.	Industrial SRV (mg/kg)	Site Concentration (mg/kg)	Site HQ (1)	NONCANCER TARGET ENDPOINTS (2)														CANCER (RISK per 100,000) (1)
					ADREN	CV/BLD	CNS/PNS	EYE	IMMUN	KIDN	LIV/GI	PROSTATE	REPRO	RESP	SKIN	SPLEEN	THYROID	WHOLE BODY	
				Cumulative Risk Level (1) =	0.000	0.006	0.017	0.003	0.000	0.001	0.002	0.000	0.003	0.003	0.003	0.000	0.006	0.007	4.80E-06
v - considered volatile. Default values of 10% soil moisture, 0.5% soil organic carbon and a 5 acre source area are utilized in Volatilization Model calculations. If site-specific values differ significantly a site-specific re-calculation should be done.																			
indicates that the theoretical soil saturation limit (Csat) is < SRV. Csat concentration represents the concentration above which free-phase liquid contamination may be present.																			
b Risk based on ingestion and dermal contact only, inhalation pathway could not be included because no inhalation toxicity value was available.																			
indicates that although chemical is a volatile the inhalation pathway could not be quantified, therefore, the SRV will underestimate the risk.																			
c Risk is based only on inhalation, the ingestion and dermal pathways could not be included because an oral toxicity value was not available.																			
(1) Site Hazard Quotient (HQ) = Site Exposure Point Conc. x (SRV HQ /SRV). Site ECR = Site Exposure Point Concentration x (SRV ECR/SRV).																			
Individual chemical specific HQ should not exceed 0.2 (except for explosives), cumulative HI should not exceed 1 for each target endpoint.																			
Cancer risk represents risk per 100,000. Individual as well as cumulative cancer risk should not exceed 1 per 100,000 (i.e., 1 E-5).																			
(2) ADREN - adrenal; CV/BLD - cardiovascular/blood system; CNS/PNS - central/peripheral nervous system; EYE - immune system; KIDN - kidney; LIV/GI - liver/gastrointestinal system; REPRO - reproductive system (incl. teratogenic/developmental effects); RESP - respiratory system; SKIN - skin irritation or other effects; SPLEEN; WHOLE BODY - increased mortality, decreased growth rate, etc.																			
Cancer Class:	Class A - Known human carcinogen																		
	Class B - Probable human carcinogen (B1 - limited evidence in humans; B2 - inadequate evidence in humans but adequate in animals)																		
	Class C - Possible human carcinogen																		
	Group D - Not Classifiable																		

MINOR FREQUENT CONSTRUCTION WORKERS

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker - Chronic Ingestion of Soil Exposure

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Value Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration (mg/kg)	Cs (back-calculated)		
IR	Ingestion Rate (mg soil/day)	200	C	
CF	Conversion Factor (kg/mg)	1.00E-06		
FI	Fraction ingested from contaminated area	1.00	U	
EF	Exposure Frequency (day/yr)	80	C	Based on site specific information exposure
ED	Exposure duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
BW	Body weight (kg)	70	C	EPA 1989b
AT	Averaging Time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

U = Upper Bound Value

Minor (0 -12) Construction/Utility Worker

Minor Conststruction/Utility Worker - Chronic Dermal Contact with Soil Exposure

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
CF	Conversion Factor (kg/mg)	1.00E-06		
SA	Skin surface area potentially in contact with dust/soil (cm2)	4900	C	25% of ave total body surface area (19400 cm2) (equivalent to hands, arms and part of head)
AF	Skin Adherence factor (mg/cm2)	0.3	C	Outdoor worker (Kissel et al., as cited in EPA 1995 Draft and EPA 1992)
ABS	Absorption factor	Chemical Specific		
EF	Exposure Frequency (day/yr)	80	NA	Assume 5 d/wk for 5 mon/yr (e.g., May - Sept) minus precipitation days (1 d/wk)
ED	Exposure Duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
BW	Body Weight (kg)	70	C	
AT	Averaging time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

M = between Central Tendency and Upper Bound Values

U = Upper Bound Value

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker - Calculation of Chronic Particulate Emission Factor (PEF)

$$PEF (m^3/kg) = (Q/C) \times [(3600 \text{ sec/hr}) / (0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x))]$$

Variable	Definition	Variable Utilized	Rationale/Reference
PEF	Particulate Emission Factor (m^3/kg)	3.83E+08	
(Q/C)	Inverse of the mean concentration at the center of a source ($g/m^2\text{-s}$ per kg/m^3)	61.03	EPA Technical Background Document for SSLs (1996) Annual Estimate Q/C value for Minneapolis for a 5 acre source (Use site-specific if available)
V	Fraction of vegetative cover	0.00	Default. (Use Cowherd et al., 1985 and site data to develop site-specific value)
U_m	Mean annual windspeed (m/s)	4.92	Based on climatic data for Minneapolis/St. Paul metropolitan area (use Cowherd et al., 1985 and site data to develop site-specific value)
U_t	Equivalent threshold value of windspeed at 7 meters (m/s)	11.32	EPA Technical Background Document for SSLs (1996) Default. (Use Cowherd et al., 1985 and site data to develop site-specific value)
F(x)	Function dependent upon U_m/U_t	0.194	EPA Technical Background Document for SSLs (1996) Derived using Cowherd et al., 1985

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker - Chronic Daily Air Concentration Estimation

Noncancer Evaluation:

$$ADC \text{ (mg/m}^3\text{)} = [Cs \times (1/VF + 1/PEF) \times EF \times ED]/AT$$

Cancer Evaluation:

$$LADC \text{ (ug/m}^3\text{)} = [Cs \times (1/VF + 1/PEF) \times EF \times ED \times 1000 \text{ ug/mg}]/AT$$

Variable	Definition	Variable Utilized	Percentile	Rationale/Reference
Cs	Soil Concentration	Cs back-calculated		
1/VF	Inverse of the volatilization factor (kg/m3)	Chemical specific calculation		EPA Methodology
1/PEF	Inverse of the particulate emission factor (kg/m3)	2.6098E-09	NA	Based on EPA 1995 SSL Technical Support Document. Information for Minneapolis. Assumes limited disturbance of soil due to wind erosion. May not be protective for dusty conditions (e.g., vehicle traffic). Use site-specific data if possible.
EF	Exposure Frequency (day/yr)	80		VF and PEF utilize annual estimates.
ED	Exposure duration (years)	25	U	95th percentile worker tenure (8 yrs - mean) US Dept. Labor. Bureau of Labor Statistics. 1991
AT	Averaging time (days)	9125		Noncancer Evaluation AT = exposure duration
		25550		Cancer Evaluation AT = 70 year lifetime

NA = Not available

C = Central Tendency Value

M = between Central Tendency and Upper Bound Values

U = Upper Bound Value

Minor (0 -12) Construction/Utility Worker

Calculation of soil saturation limit (volatilization model is only applicable if Cs is < Csat)

$$C_{sat} \text{ (mg/kg)} = (S/P_b) \times [(K_d \times P_b) + \theta_w + (H' \times \theta_a)]$$

Variable	Definition	Variable Utilized	Rationale/Reference
Csat	Soil Saturation Concentration (mg/kg)	Csat back-calculated	
S	Solubility in water (mg/l)	Chemical Specific	
P _b	Soil bulk density (kg/l)	1.5	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)
K _d	Soil water partition coefficient (l/kg) = K _{oc} x f _{oc}	Chemical -Specific/Site-Specific	
K _{oc}	Organic carbon partition coefficient (l/kg)	Chemical Specific	
f _{oc}	Organic carbon content of soil	0.005	Default, use site specific if available.
θ _w	Water filled soil porosity (unitless) = f _m x P _b	0.150	Calculated
f _m	Average unsaturated zone soil gravimetric water content (kg water/kg soil)	0.1	Default. Use Site Specific information if available
H'	Modified Henry's constant = 41 x H	Chemical Specific	
H	Henry's constant (atm - m3/mol)	Chemical Specific	
θ _a	Air-filled soil porosity (unitless) = n - θ _w	0.28	Calculated
n	Total soil porosity (unitless) = 1 - P _v /P _a	0.43	Calculated
P _a	Soil density or particulate density (kg/l)	2.65	EPA Technical Background Document for SSLs (1996) (Use site-specific information if available)

Csat for each contaminant is the concentration at which the adsorptive limit of the soil plus the theoretical dissolution limit of the contaminant in the available soil moisture has been reached. Concentrations > Csat indicates "free phase" contaminants within the soil matrix. The equation presented here is a modification of the equation presented in Part B RAGS guidance. The above equation takes into account the amount of contaminant that is in vapor phase in the pore spaces of the soil.

Minor (0 -12) Construction/Utility Worker

$$VF (m^3/kg) = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times P_b \times D_a)] \times 10^{-4} m^2/cm^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Inorganics							
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium III							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury (inorganic)	3.07E-02	6.30E-06	1.46E-05		5.20E+01	1.14E-02	2.64E+04
Nickel							
Potassium							
Selenium							
Sodium							
Thallium							
Vanadium							
Zinc							
Organics							
Acetone	1.00E-01	1.10E-05	4.19E-05	2.20E+00	1.10E-02	2.10E-05	1.56E+04
Benzene	8.80E-02	9.80E-06	2.26E-03	6.50E+01	3.25E-01	5.50E-03	2.13E+03
Bromomethane (methyl bromide)	1.00E-01	1.20E-05	1.70E-03	1.30E+02	6.50E-01	6.20E-03	2.46E+03
Butyl benzylphthalate							

Minor (0 -12) Construction/Utility Worker

$$VF \text{ (m}^3\text{/kg)} = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times P_b \times D_a)] \times 10^{-4} \text{ m}^2\text{/cm}^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Carbazole							
Carbon Disulfide	1.10E-01	1.00E-05	6.23E-03	5.40E+01	2.70E-01	1.20E-02	1.28E+03
Chlorobenzene	7.20E-02	6.80E-06	3.27E-04	3.30E+02	1.65E+00	3.70E-03	5.60E+03
4-Chloro-3-methylphenol							
Dibenzofuran (unsubstituted)	6.00E-02	1.00E-05	4.52E-08	7.80E+03	3.90E+01	1.30E-05	4.76E+05
Dibutyl phthalate							
1,1 - Dichloroethane	9.10E-02	1.10E-05	3.02E-03	3.00E+01	1.50E-01	4.30E-03	1.84E+03
1,2 - Dichloroethylene (mixed isomers)	7.90E-02	1.10E-05	2.55E-03	5.90E+01	2.95E-01	6.60E-03	2.00E+03
Dichloromethane (methylene chloride)	1.00E-01	1.17E-05	3.46E-03	8.80E+00	4.40E-02	2.60E-03	1.72E+03
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)							
Di - n - octyl phthalate	1.51E-02	3.58E-06	5.57E-12	8.00E+07	4.00E+05	6.68E-05	4.29E+07
Ethyl benzene	7.90E-02	7.80E-06	1.08E-03	2.20E+02	1.10E+00	7.90E-03	3.08E+03
Methyl ethyl ketone (2-butanone)	9.00E-02	9.80E-06	4.38E-05	4.50E+00	2.25E-02	2.70E-05	1.53E+04
Methyl butyl ketone (MBK)(2-hexanone)							
Methyl isobutyl ketone (MIBK)(4-methyl	7.50E-02	7.80E-06	3.06E-05	1.30E+02	6.50E-01	1.40E-04	1.83E+04
PAHs (Polynuclear Aromatic Hydrocarbons)							
Acenaphthene	6.40E-02	7.70E-06	7.26E-06	4.60E+03	2.30E+01	1.20E-03	3.76E+04
Acenaphthylene	4.39E-02	7.07E-06	3.13E-07	7.00E+03	3.50E+01	1.14E-04	1.81E+05
Anthracene	5.80E-02	7.70E-06	6.69E-08	1.30E+04	6.50E+01	3.40E-05	3.91E+05
Benz[a]anthracene							
Benzo[b]fluoranthene							
Benzo(g,h,i)perylene							
Benzo[k]fluoranthene							
Benzo(a)pyrene							
Chrysene							
Dibenz[ah]anthracene							
Fluoranthene							
Fluorene	6.10E-02	7.90E-06	2.60E-07	7.90E+03	3.95E+01	7.70E-05	1.98E+05
Indeno[1,2,3-cd]pyrene							
2-Methylnaphthalene							

Minor (0 -12) Construction/Utility Worker

$$VF (m^3/kg) = (Q/C) \times [(3.14 \times D_a \times T)^{1/2} / (2 \times P_b \times D_a)] \times 10^{-4} m^2/cm^2$$

Calculation of the Volatilization Factor (VF)

Chemical	Di (cm2/s)	Dw (cm2/s)	Da (cm2/s)	Koc (cm3/g)	Kd (cm3/g)	Henry's (atm-m3/ mol)	Worker VF (m3/kg)
Naphthalene	6.90E-02	7.50E-06	2.96E-05	1.30E+03	6.50E+00	1.30E-03	1.86E+04
Phenanthrene							
Pyrene	2.70E-02	7.20E-06	1.06E-09	1.20E+05	6.00E+02	1.00E-05	3.11E+06
PCBs (Polychlorinated Biphenyls)							
Pentachlorophenol							
Phenol							
Styrene	7.10E-02	8.00E-06	1.86E-04	3.60E+02	1.80E+00	2.30E-03	7.42E+03
Tetrachloroethylene (PCE)	7.20E-02	8.20E-06	1.01E-03	6.60E+02	3.30E+00	2.30E-02	3.18E+03
Toluene	7.80E-02	8.60E-06	7.75E-04	2.60E+02	1.30E+00	6.60E-03	3.64E+03
1,1,1 - Trichloroethane	8.00E-02	8.80E-06	5.61E-04	1.50E+02	7.50E-01	2.80E-03	4.27E+03
Trichloroethylene (TCE)	8.10E-02	9.10E-06	1.92E-03	1.30E+02	6.50E-01	8.90E-03	2.31E+03
Xylenes (mixed)	7.20E-02	8.40E-06	6.22E-04	2.40E+02	1.20E+00	5.30E-03	4.06E+03

Minor (0 -12) Construction/Utility Worker

$$Csat \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	Koc (l/kg)	S (mg/l)	H (atm-m3/ mol)	Csat (mg/kg)
Inorganics				
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium				
Cadmium				
Calcium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Iron				
Lead				
Magnesium				
Manganese				
Mercury (inorganic)				
Nickel				
Potassium				
Selenium				
Sodium				
Thallium				
Vanadium				
Zinc				
Organics				
Acetone	2.20E+00	1.00E+06	2.10E-05	111163
Benzene	6.50E+01	1.80E+03	5.50E-03	842
Bromomethane (methyl bromide)	1.30E+02	1.80E+04	6.20E-03	14366
Butyl benzylphthalate				

Minor (0 -12) Construction/Utility Worker

$$Csat \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	Koc (l/kg)	S (mg/l)	H (atm-m3/ mol)	Csat (mg/kg)
Carbazole				
Carbon Disulfide	5.40E+01	2.90E+03	1.20E-02	1343
Chlorobenzene	3.30E+02	4.70E+02	3.70E-03	836
4-Chloro-3-methylphenol				
Dibenzofuran (unsubstituted)	7.80E+03	3.10E+00	1.30E-05	121
Dibutyl phthalate				
1,1 - Dichloroethane	3.00E+01	5.50E+03	4.30E-03	1559
1,2 - Dichloroethylene (mixed isomers)	5.90E+01	6.30E+03	6.60E-03	2811
Dichloromethane (methylene chloride)	8.80E+00	1.32E+04	2.60E-03	2167
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl phthalate)				
Di - n - octyl phthalate	8.00E+07	2.00E-02	6.68E-05	8000
Ethyl benzene	2.20E+02	1.50E+02	7.90E-03	189
Methyl ethyl ketone (2-butanone)	4.50E+00	2.70E+05	2.70E-05	33132
Methyl butyl ketone (MBK)(2-hexanone)				
Methyl isobutyl ketone (MIBK)(4-methyl	1.30E+02	1.90E+04	1.40E-04	14271
PAHs (Polynuclear Aromatic Hydrocarbons)				
Acenaphthene	4.60E+03	3.90E+00	1.20E-03	90
Acenaphthylene	7.00E+03	3.93E+00	1.14E-04	138
Anthracene	1.30E+04	7.50E-02	3.40E-05	5
Benz[a]anthracene				
Benzo[b]fluoranthene				
Benzo(g,h,i)perylene				
Benzo[k]fluoranthene				
Benzo(a)pyrene				
Chrysene				
Dibenz[ah]anthracene				
Fluoranthene				
Fluorene	7.90E+03	9.00E+01	7.70E-05	3564
Indeno[1,2,3-cd]pyrene				
2-Methylnaphthalene				

Minor (0 -12) Construction/Utility Worker

$$C_{sat} \text{ (mg/kg)} = (S/\rho_b) \times [(K_d \times \rho_b) + \theta_w + (H' \times \theta_a)]$$

Calculation of Soil Saturation Limit

Chemical	K _{oc} (l/kg)	S (mg/l)	H (atm-m ³ /mol)	C _{sat} (mg/kg)
Naphthalene	1.30E+03	2.40E+02	1.30E-03	1586
Phenanthrene	0.00E+00	0.00E+00	0.00E+00	0
Pyrene	1.20E+05	1.00E+02	1.00E-05	60010
PCBs (Polychlorinated Biphenyls)				
Pentachlorophenol				
Phenol				
Styrene	3.60E+02	6.80E+02	2.30E-03	1304
Tetrachloroethylene (PCE)	6.60E+02	1.50E+02	2.30E-02	537
Toluene	2.60E+02	8.80E+02	6.60E-03	1277
1,1,1 - Trichloroethane	1.50E+02	9.80E+02	2.80E-03	854
Trichloroethylene (TCE)	1.30E+02	1.00E+03	8.90E-03	819
Xylenes (mixed)	2.40E+02	2.00E+02	5.30E-03	268

Minor (0 -12) Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Inorganics											
Aluminum	7830	200	1.00E-06	1.00	80	25	70	9125	4.90E-03	25550	1.75E-03
Antimony	3.4	200	1.00E-06	1.00	80	25	70	9125	2.13E-06	25550	7.60E-07
Arsenic	13.8	200	1.00E-06	1.00	80	25	70	9125	8.64E-06	25550	3.09E-06
Barium	201	200	1.00E-06	1.00	80	25	70	9125	1.26E-04	25550	4.50E-05
Beryllium	0.7	200	1.00E-06	1.00	80	25	70	9125	4.38E-07	25550	1.57E-07
Cadmium	0.75	200	1.00E-06	1.00	80	25	70	9125	4.70E-07	25550	1.68E-07
Calcium	46500	200	1.00E-06	1.00	80	25	70	9125	2.91E-02	25550	1.04E-02
Chromium III	91	200	1.00E-06	1.00	80	25	70	9125	5.70E-05	25550	2.04E-05
Chromium VI	618	200	1.00E-06	1.00	80	25	70	9125	3.87E-04	25550	1.38E-04
Cobalt	11.4	200	1.00E-06	1.00	80	25	70	9125	7.14E-06	25550	2.55E-06
Copper	1360	200	1.00E-06	1.00	80	25	70	9125	8.52E-04	25550	3.04E-04
Iron	48400	200	1.00E-06	1.00	80	25	70	9125	3.03E-02	25550	1.08E-02
Lead	733	200	1.00E-06	1.00	80	25	70	9125	4.59E-04	25550	1.64E-04
Magnesium	20000	200	1.00E-06	1.00	80	25	70	9125	1.25E-02	25550	4.47E-03
Manganese	2490	200	1.00E-06	1.00	80	25	70	9125	1.56E-03	25550	5.57E-04
Mercury (inorganic)	0.32	200	1.00E-06	1.00	80	25	70	9125	2.00E-07	25550	7.16E-08
Nickel	33.5	200	1.00E-06	1.00	80	25	70	9125	2.10E-05	25550	7.49E-06
Potassium	1350	200	1.00E-06	1.00	80	25	70	9125	8.45E-04	25550	3.02E-04
Selenium	1.3	200	1.00E-06	1.00	80	25	70	9125	8.14E-07	25550	2.91E-07
Sodium	487	200	1.00E-06	1.00	80	25	70	9125	3.05E-04	25550	1.09E-04
Thallium	0.24	200	1.00E-06	1.00	80	25	70	9125	1.50E-07	25550	5.37E-08
Vanadium	35.6	200	1.00E-06	1.00	80	25	70	9125	2.23E-05	25550	7.96E-06
Zinc	479	200	1.00E-06	1.00	80	25	70	9125	3.00E-04	25550	1.07E-04
Organics											
Acetone	1.7	200	1.00E-06	1.00	80	25	70	9125	1.06E-06	25550	3.80E-07
Benzene	0.024	200	1.00E-06	1.00	80	25	70	9125	1.50E-08	25550	5.37E-09
Bromomethane (methyl bromide)	0.002	200	1.00E-06	1.00	80	25	70	9125	1.25E-09	25550	4.47E-10
Butyl benzylphthalate	3.6	200	1.00E-06	1.00	80	25	70	9125	2.25E-06	25550	8.05E-07
Carbazole	0.53	200	1.00E-06	1.00	80	25	70	9125	3.32E-07	25550	1.19E-07

Minor (0 -12) Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Carbon Disulfide	0.014	200	1.00E-06	1.00	80	25	70	9125	8.77E-09	25550	3.13E-09
Chlorobenzene	0	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11	200	1.00E-06	1.00	80	25	70	9125	6.89E-06	25550	2.46E-06
Dibenzofuran (unsubstituted)	0.25	200	1.00E-06	1.00	80	25	70	9125	1.57E-07	25550	5.59E-08
Dibutyl phthalate	0.14	200	1.00E-06	1.00	80	25	70	9125	8.77E-08	25550	3.13E-08
1,1 - Dichloroethane	0.011	200	1.00E-06	1.00	80	25	70	9125	6.89E-09	25550	2.46E-09
1,2 - Dichloroethylene (mixed isomers)	15	200	1.00E-06	1.00	80	25	70	9125	9.39E-06	25550	3.35E-06
Dichloromethane (methylene chloride)	0	200	1.00E-06	1.00	80	25	70	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhex	4.4	200	1.00E-06	1.00	80	25	70	9125	2.76E-06	25550	9.84E-07
Di - n - octyl phthalate	0.084	200	1.00E-06	1.00	80	25	70	9125	5.26E-08	25550	1.88E-08
Ethyl benzerie	0.72	200	1.00E-06	1.00	80	25	70	9125	4.51E-07	25550	1.61E-07
Methyl ethyl ketone (2-butanone)	0.21	200	1.00E-06	1.00	80	25	70	9125	1.32E-07	25550	4.70E-08
Methyl butyl ketone (MBK)(2-hexanone)	0.026	200	1.00E-06	1.00	80	25	70	9125	1.63E-08	25550	5.81E-09
Methyl isobutyl ketone (MIBK)(4-methyl-	0.15	200	1.00E-06	1.00	80	25	70	9125	9.39E-08	25550	3.35E-08
PAHs (Polynuclear Aromatic Hydrocarbons)											
Acenaphthene	0.65	200	1.00E-06	1.00	80	25	70	9125	4.07E-07	25550	1.45E-07
Acenaphthylene	0.76	200	1.00E-06	1.00	80	25	70	9125	4.76E-07	25550	1.70E-07
Anthracene	0.64	200	1.00E-06	1.00	80	25	70	9125	4.01E-07	25550	1.43E-07
Benz[a]anthracene	3.5	200	1.00E-06	1.00	80	25	70	9125	2.19E-06	25550	7.83E-07
Benzo[b]fluoranthene	3.6	200	1.00E-06	1.00	80	25	70	9125	2.25E-06	25550	8.05E-07
Benzo(g,h,i)perylene	0.82	200	1.00E-06	1.00	80	25	70	9125	5.14E-07	25550	1.83E-07
Benzo[k]fluoranthene	1.3	200	1.00E-06	1.00	80	25	70	9125	8.14E-07	25550	2.91E-07
Benzo(a)pyrene	1.7	200	1.00E-06	1.00	80	25	70	9125	1.06E-06	25550	3.80E-07
Chrysene	1.7	200	1.00E-06	1.00	80	25	70	9125	1.06E-06	25550	3.80E-07
Dibenz[ah]anthracene	0.4	200	1.00E-06	1.00	80	25	70	9125	2.50E-07	25550	8.95E-08
Fluoranthene	5.6	200	1.00E-06	1.00	80	25	70	9125	3.51E-06	25550	1.25E-06
Fluorene	0.76	200	1.00E-06	1.00	80	25	70	9125	4.76E-07	25550	1.70E-07
Indeno[1,2,3-cd]pyrene	1.1	200	1.00E-06	1.00	80	25	70	9125	6.89E-07	25550	2.46E-07
2-Methylnaphthalene	1	200	1.00E-06	1.00	80	25	70	9125	6.26E-07	25550	2.24E-07
Naphthalene	2.3	200	1.00E-06	1.00	80	25	70	9125	1.44E-06	25550	5.14E-07
Phenanthrene	5	200	1.00E-06	1.00	80	25	70	9125	3.13E-06	25550	1.12E-06

Minor (0 -12) Construction/Utility Worker

$$\text{Intake (mg/kg-day)} = (\text{Cs} \times \text{IR} \times \text{CF} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker1. Exposure Calculation for Surface Soil Ingestion

Chemical	Cs (mg/kg)	IR (mg soil/d)	CF (kg/mg)	FI	EF (d/yr)	ED (yr)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Pyrene	4.8	200	1.00E-06	1.00	80	25	70	9125	3.01E-06	25550	1.07E-06
PCBs (Polychlorinated Biphenyls)	0.44	200	1.00E-06	1.00	80	25	70	9125	2.76E-07	25550	9.84E-08
Pentachlorophenol	0.05	200	1.00E-06	1.00	80	25	70	9125	3.13E-08	25550	1.12E-08
Phenol	0.12	200	1.00E-06	1.00	80	25	70	9125	7.51E-08	25550	2.68E-08
Styrene	0.054	200	1.00E-06	1.00	80	25	70	9125	3.38E-08	25550	1.21E-08
Tetrachloroethylene (PCE)	0.76	200	1.00E-06	1.00	80	25	70	9125	4.76E-07	25550	1.70E-07
Toluene	1	200	1.00E-06	1.00	80	25	70	9125	6.26E-07	25550	2.24E-07
1,1,1 - Trichloroethane	0.056	200	1.00E-06	1.00	80	25	70	9125	3.51E-08	25550	1.25E-08
Trichloroethylene (TCE)	1.1	200	1.00E-06	1.00	80	25	70	9125	6.89E-07	25550	2.46E-07
Xylenes (mixed)	7.3	200	1.00E-06	1.00	80	25	70	9125	4.57E-06	25550	1.63E-06

Minor (0 -12) Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm2)	CF (kg/mg)	AF (mg/cm2)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Inorganics												
Aluminum	7830.00	4900	1.00E-06	0.30	0.001	80	25	70	9125	3.60E-05	25550	1.29E-05
Antimony	3.40	4900	1.00E-06	0.30	0.001	80	25	70	9125	1.56E-08	25550	5.59E-09
Arsenic	13.80	4900	1.00E-06	0.30	0.03	80	25	70	9125	1.91E-06	25550	6.81E-07
Barium	201.00	4900	1.00E-06	0.30	0.001	80	25	70	9125	9.25E-07	25550	3.30E-07
Beryllium	0.70	4900	1.00E-06	0.30	0.001	80	25	70	9125	3.22E-09	25550	1.15E-09
Cadmium	0.75	4900	1.00E-06	0.30	0.01	80	25	70	9125	3.45E-08	25550	1.23E-08
Calcium	46500.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Chromium III	91.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	4.19E-06	25550	1.50E-06
Chromium VI	618.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	2.84E-05	25550	1.02E-05
Cobalt	11.40	4900	1.00E-06	0.30	0.01	80	25	70	9125	5.25E-07	25550	1.87E-07
Copper	1360.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	6.26E-05	25550	2.24E-05
Iron	48400.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Lead	733.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Magnesium	20000.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Manganese	2490.00	4900	1.00E-06	0.30	0.001	80	25	70	9125	1.15E-05	25550	4.09E-06
Mercury (inorganic)	0.32	4900	1.00E-06	0.30	0.05	80	25	70	9125	7.36E-08	25550	2.63E-08
Nickel	33.50	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.54E-06	25550	5.51E-07
Potassium	1350.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Selenium	1.30	4900	1.00E-06	0.30	0.01	80	25	70	9125	5.98E-08	25550	2.14E-08
Sodium	487.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Thallium	0.24	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.10E-08	25550	3.95E-09
Vanadium	35.60	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.64E-06	25550	5.85E-07
Zinc	479.00	4900	1.00E-06	0.30	0.01	80	25	70	9125	2.20E-05	25550	7.87E-06
Organics												
Acetone	1.70	4900	1.00E-06	0.30	0.1	80	25	70	9125	7.82E-07	25550	2.79E-07
Benzene	0.02	4900	1.00E-06	0.30	0.01	80	25	70	9125	1.10E-09	25550	3.95E-10
Bromomethane (methyl bromide)	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	4.60E-10	25550	1.64E-10
Butyl benzylphthalate	3.60	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.66E-06	25550	5.92E-07
Carbazole	0.53	4900	1.00E-06	0.30	0.1	80	25	70	9125	2.44E-07	25550	8.71E-08
Carbon Disulfide	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	3.22E-09	25550	1.15E-09
Chlorobenzene	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA

Minor (0 -12) Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm2)	CF (kg/mg)	AF (mg/cm2)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Dibenzofuran (unsubstituted)	0.25	4900	1.00E-06	0.30	0.1	80	25	70	9125	1.15E-07	25550	4.11E-08
Dibutyl phthalate	0.14	4900	1.00E-06	0.30	0.1	80	25	70	9125	6.44E-08	25550	2.30E-08
1,1 - Dichloroethane	0.01	4900	1.00E-06	0.30	0.05	80	25	70	9125	2.53E-09	25550	9.04E-10
1,2 - Dichloroethylene (mixed isomers)	15.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	3.45E-06	25550	1.23E-06
Dichloromethane (methylene chloride)	0.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhex	4.40	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.01E-06	25550	3.62E-07
Di - n - octyl phthalate	0.08	4900	1.00E-06	0.30	0.1	80	25	70	9125	3.87E-08	25550	1.38E-08
Ethyl benzene	0.72	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.66E-07	25550	5.92E-08
Methyl ethyl ketone (2-butanone)	0.21	4900	1.00E-06	0.30	0.1	80	25	70	9125	9.67E-08	25550	3.45E-08
Methyl butyl ketone (MBK)(2-hexanone	0.03	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Methyl isobutyl ketone (MIBK)(4-methyl	0.15	4900	1.00E-06	0.30	0.05	80	25	70	9125	3.45E-08	25550	1.23E-08
PAHs (Polynuclear Aromatic Hydrocarbons)												
Acenaphthene	0.65	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.50E-07	25550	5.34E-08
Acenaphthylene	0.76	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Anthracene	0.64	4900	1.00E-06	0.30	0.1	80	25	70	9125	2.95E-07	25550	1.05E-07
Benz[a]anthracene	3.50	4900	1.00E-06	0.30	0.13	80	25	70	9125	2.09E-06	25550	7.48E-07
Benzo[b]fluoranthene	3.60	4900	1.00E-06	0.30	0.13	80	25	70	9125	2.15E-06	25550	7.69E-07
Benzo(g,h,i)perylene	0.82	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Benzo[k]fluoranthene	1.30	4900	1.00E-06	0.30	0.13	80	25	70	9125	7.78E-07	25550	2.78E-07
Benzo(a)pyrene	1.70	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.02E-06	25550	3.63E-07
Chrysene	1.70	4900	1.00E-06	0.30	0.13	80	25	70	9125	1.02E-06	25550	3.63E-07
Dibenz[ah]anthracene	0.40	4900	1.00E-06	0.30	0.13	80	25	70	9125	2.39E-07	25550	8.55E-08
Fluoranthene	5.60	4900	1.00E-06	0.30	0.13	80	25	70	9125	3.35E-06	25550	1.20E-06
Fluorene	0.76	4900	1.00E-06	0.30	0.1	80	25	70	9125	3.50E-07	25550	1.25E-07
Indeno[1,2,3-cd]pyrene	1.10	4900	1.00E-06	0.30	0.13	80	25	70	9125	6.58E-07	25550	2.35E-07
2-Methylnaphthalene	1.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Naphthalene	2.30	4900	1.00E-06	0.30	0.05	80	25	70	9125	5.29E-07	25550	1.89E-07
Phenanthrene	5.00	4900	1.00E-06	0.30	NA	80	25	70	9125	NA	25550	NA
Pyrene	4.80	4900	1.00E-06	0.30	0.1	80	25	70	9125	2.21E-06	25550	7.89E-07
PCBs (Polychlorinated Biphenyls)	0.44	4900	1.00E-06	0.30	0.15	80	25	70	9125	3.04E-07	25550	1.08E-07
Pentachlorophenol	0.05	4900	1.00E-06	0.30	0.25	80	25	70	9125	5.75E-08	25550	2.05E-08
Phenol	0.12	4900	1.00E-06	0.30	0.8	80	25	70	9125	4.42E-07	25550	1.58E-07
Styrene	0.05	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.24E-08	25550	4.44E-09
Tetrachloroethylene (PCE)	0.76	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.75E-07	25550	6.25E-08

Minor (0 -12) Construction/Utility Worker

$$\text{Dose (mg/kg-day)} = (\text{Cs} \times \text{CF} \times \text{SA} \times \text{AF} \times \text{ABS} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Minor Construction/Utility Worker2. Exposure Calculation for Dermal Contact with Surface Soil

Chemical	Cs (mg/kg)	SA (cm2)	CF (kg/mg)	AF (mg/cm2)	ABS	EF (day/yr)	ED (years)	BW (kg)	AT (days)	Noncarcin ADD (mg/kg-d)	AT (days) (Carcin)	Carcin LADD (mg/kg-d)
Toluene	1.00	4900	1.00E-06	0.30	0.05	80	25	70	9125	2.30E-07	25550	8.22E-08
1,1,1 - Trichloroethane	0.06	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.29E-08	25550	4.60E-09
Trichloroethylene (TCE)	1.10	4900	1.00E-06	0.30	0.05	80	25	70	9125	2.53E-07	25550	9.04E-08
Xylenes (mixed)	7.30	4900	1.00E-06	0.30	0.05	80	25	70	9125	1.68E-06	25550	6.00E-07

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Inorganics									
Aluminum	7830.00		2.6098E-09	80	25	9125	4.48E-06	25550	1.60E-03
Antimony	3.40		2.6098E-09	80	25	9125	1.94E-09	25550	6.95E-07
Arsenic	13.80		2.6098E-09	80	25	9125	7.89E-09	25550	2.82E-06
Barium	201.00		2.6098E-09	80	25	9125	1.15E-07	25550	4.11E-05
Beryllium	0.70		2.6098E-09	80	25	9125	4.00E-10	25550	1.43E-07
Cadmium	0.75		2.6098E-09	80	25	9125	4.29E-10	25550	1.53E-07
Calcium	46500.00		2.6098E-09	80	25	9125	2.66E-05	25550	9.50E-03
Chromium III	91.00		2.6098E-09	80	25	9125	5.21E-08	25550	1.86E-05
Chromium VI	618.00		2.6098E-09	80	25	9125	3.54E-07	25550	1.26E-04
Cobalt	11.40		2.6098E-09	80	25	9125	6.52E-09	25550	2.33E-06
Copper	1360.00		2.6098E-09	80	25	9125	7.78E-07	25550	2.78E-04
Iron	48400.00		2.6098E-09	80	25	9125	2.77E-05	25550	9.89E-03
Lead	733.00		2.6098E-09	80	25	9125	4.19E-07	25550	1.50E-04
Magnesium	20000.00		2.6098E-09	80	25	9125	1.14E-05	25550	4.09E-03
Manganese	2490.00		2.6098E-09	80	25	9125	1.42E-06	25550	5.09E-04
Mercury (inorganic)	0.32	3.78E-05	2.6098E-09	80	25	9125	2.65E-06	25550	9.47E-04
Nickel	33.50		2.6098E-09	80	25	9125	1.92E-08	25550	6.84E-06
Potassium	1350.00		2.6098E-09	80	25	9125	7.72E-07	25550	2.76E-04
Selenium	1.30		2.6098E-09	80	25	9125	7.44E-10	25550	2.66E-07
Sodium	487.00		2.6098E-09	80	25	9125	2.79E-07	25550	9.95E-05
Thallium	0.24		2.6098E-09	80	25	9125	1.37E-10	25550	4.90E-08
Vanadium	35.60		2.6098E-09	80	25	9125	2.04E-08	25550	7.27E-06
Zinc	479.00		2.6098E-09	80	25	9125	2.74E-07	25550	9.79E-05
Organics									
Acetone	1.70	6.39E-05	2.6098E-09	80	25	9125	2.38E-05	25550	8.51E-03
Benzene	0.02	4.70E-04	2.6098E-09	80	25	9125	2.47E-06	25550	8.82E-04
Bromomethane (methyl bromide)	0.00	4.07E-04	2.6098E-09	80	25	9125	1.78E-07	25550	6.37E-05
Butyl benzylphthalate	3.60		2.6098E-09	80	25	9125	2.06E-09	25550	7.35E-07
Carbazole	0.53		2.6098E-09	80	25	9125	3.03E-10	25550	1.08E-07
Carbon Disulfide	0.01	7.80E-04	2.6098E-09	80	25	9125	2.39E-06	25550	8.54E-04

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility 'Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Chlorobenzene	0.00	1.79E-04	2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
4-Chloro-3-methylphenol	11.00		2.6098E-09	80	25	9125	6.29E-09	25550	2.25E-06
Dibenzofuran (unsubstituted)	0.25	2.10E-06	2.6098E-09	80	25	9125	1.15E-07	25550	4.12E-05
Dibutyl phthalate	0.14		2.6098E-09	80	25	9125	8.01E-11	25550	2.86E-08
1,1 - Dichloroethane	0.01	5.43E-04	2.6098E-09	80	25	9125	1.31E-06	25550	4.67E-04
1,2 - Dichloroethylene (mixed isomers)	15.00	4.99E-04	2.6098E-09	80	25	9125	1.64E-03	25550	5.86E-01
Dichloromethane (methylene chloride)	0.00	5.81E-04	2.6098E-09	80	25	9125	0.00E+00	25550	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhex	4.40		2.6098E-09	80	25	9125	2.52E-09	25550	8.99E-07
Di - n - octyl phthalate	0.08	2.33E-08	2.6098E-09	80	25	9125	4.77E-10	25550	1.70E-07
Ethyl benzene	0.72	3.25E-04	2.6098E-09	80	25	9125	5.13E-05	25550	1.83E-02
Methyl ethyl ketone (2-butanone)	0.21	6.54E-05	2.6098E-09	80	25	9125	3.01E-06	25550	1.07E-03
Methyl butyl ketone (MBK)(2-hexanone	0.03		2.6098E-09	80	25	9125	1.49E-11	25550	5.31E-09
Methyl isobutyl ketone (MIBK)(4-methyl	0.15	5.47E-05	2.6098E-09	80	25	9125	1.80E-06	25550	6.42E-04
PAHs (Polynuclear Aromatic Hydrocarbons)									
Acenaphthene	0.65	2.66E-05	2.6098E-09	80	25	9125	3.79E-06	25550	1.35E-03
Acenaphthylene	0.76	5.52E-06	2.6098E-09	80	25	9125	9.21E-07	25550	3.29E-04
Anthracene	0.64	2.56E-06	2.6098E-09	80	25	9125	3.59E-07	25550	1.28E-04
Benz[a]anthracene	3.50		2.6098E-09	80	25	9125	2.00E-09	25550	7.15E-07
Benzo[b]fluoranthene	3.60		2.6098E-09	80	25	9125	2.06E-09	25550	7.35E-07
Benzo(g,h,i)perylene	0.82		2.6098E-09	80	25	9125	4.69E-10	25550	1.68E-07
Benzo[k]fluoranthene	1.30		2.6098E-09	80	25	9125	7.44E-10	25550	2.66E-07
Benzo(a)pyrene	1.70		2.6098E-09	80	25	9125	9.72E-10	25550	3.47E-07
Chrysene	1.70		2.6098E-09	80	25	9125	9.72E-10	25550	3.47E-07
Dibenz[ah]anthracene	0.40		2.6098E-09	80	25	9125	2.29E-10	25550	8.17E-08
Fluoranthene	5.60		2.6098E-09	80	25	9125	3.20E-09	25550	1.14E-06
Fluorene	0.76	5.04E-06	2.6098E-09	80	25	9125	8.40E-07	25550	3.00E-04
Indeno[1,2,3-cd]pyrene	1.10		2.6098E-09	80	25	9125	6.29E-10	25550	2.25E-07
2-Methylnaphthalene	1.00		2.6098E-09	80	25	9125	5.72E-10	25550	2.04E-07
Naphthalene	2.30	5.38E-05	2.6098E-09	80	25	9125	2.71E-05	25550	9.69E-03
Phenanthrene	5.00		2.6098E-09	80	25	9125	2.86E-09	25550	1.02E-06
Pyrene	4.80	3.21E-07	2.6098E-09	80	25	9125	3.41E-07	25550	1.22E-04
PCBs (Polychlorinated Biphenyls)	0.44		2.6098E-09	80	25	9125	2.52E-10	25550	8.99E-08

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker3. Calculation of average air concentration

Chemical	Cs (mg/kg)	1/VF (kg/m3)	1/PEF (kg/m3)	EF (day/yr)	ED (years)	AT (days) (Noncar)	Noncarcin ADC (mg/m3)	AT (days) (Carcin)	Carcin LADC (ug/m3)
Pentachlorophenol	0.05		2.6098E-09	80	25	9125	2.86E-11	25550	1.02E-08
Phenol	0.12		2.6098E-09	80	25	9125	6.86E-11	25550	2.45E-08
Styrene	0.05	1.35E-04	2.6098E-09	80	25	9125	1.59E-06	25550	5.70E-04
Tetrachloroethylene (PCE)	0.76	3.14E-04	2.6098E-09	80	25	9125	5.23E-05	25550	1.87E-02
Toluene	1.00	2.75E-04	2.6098E-09	80	25	9125	6.03E-05	25550	2.15E-02
1,1,1 - Trichloroethane	0.06	2.34E-04	2.6098E-09	80	25	9125	2.87E-06	25550	1.03E-03
Trichloroethylene (TCE)	1.10	4.33E-04	2.6098E-09	80	25	9125	1.04E-04	25550	3.73E-02
Xylenes (mixed)	7.30	2.46E-04	2.6098E-09	80	25	9125	3.94E-04	25550	1.41E-01

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker4. Summary of Exposure and Noncarcinogenic Risk Calculations

Chemical	Oral RfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation RfC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Inorganics														
Aluminum	1.00	4.90E-03	1.00	0.005	58%	3.60E-05	0.01	0.004	42%	NA	4.48E-06			0.009
Antimony	0.00	2.13E-06	1.00	0.005	87%	1.56E-08	0.05	0.001	13%	2.00E-04	1.94E-09	0.000	0%	0.006
Arsenic	0.00	8.64E-06	1.00	0.029	80%	1.91E-06	0.90	0.007	20%	5.00E-04	7.89E-09	0.000	0%	0.036
Barium	0.07	1.26E-04	1.00	0.002	78%	9.25E-07	0.05	0.000	12%	5.00E-04	1.15E-07	0.000	10%	0.002
Beryllium	0.00	4.38E-07	1.00	0.000	55%	3.22E-09	0.01	0.000	40%	2.00E-05	4.00E-10	0.000	5%	0.000
Cadmium	0.00	4.70E-07	1.00	0.000	93%	3.45E-08	1.00	0.000	7%	2.00E-04	4.29E-10	0.000	0%	0.001
Calcium	NA	2.91E-02	NA			NA	NA			NA	NA			
Chromium III	1.00	5.70E-05	1.00	0.000	40%	4.19E-06	0.05	0.000	60%	NA	5.21E-08			0.000
Chromium VI	0.01	3.87E-04	1.00	0.077	21%	2.84E-05	0.05	0.114	31%	2.00E-06	3.54E-07	0.177	48%	0.368
Cobalt	0.06	7.14E-06	1.00	0.000	83%	5.25E-07	0.50	0.000	12%	1.02E-03	6.52E-09	0.000	4%	0.000
Copper	0.04	8.52E-04	1.00	0.023	89%	6.26E-05	0.60	0.003	11%	NA	7.78E-07			0.026
Iron	NA	3.03E-02	NA			NA	NA			NA	NA			
Lead	NA	4.59E-04	NA			NA	NA			NA	NA			
Magnesium	NA	1.25E-02	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Manganese	0.05	1.56E-03	1.00	0.033	50%	1.15E-05	0.05	0.005	7%	5.00E-05	1.42E-06	0.028	43%	0.067
Mercury (inorganic)	0.00	2.00E-07	1.00	0.001	6%	7.36E-08	0.20	0.001	11%	3.00E-04	2.65E-06	0.009	82%	0.011
Nickel	0.02	2.10E-05	1.00	0.001	40%	1.54E-06	0.05	0.002	60%	NA	1.92E-08			0.003
Potassium	NA	8.45E-04	NA			NA	NA			NA	NA			
Selenium	0.01	8.14E-07	1.00	0.000	92%	5.98E-08	0.90	0.000	8%	NA	7.44E-10			0.000
Sodium	NA	3.05E-04	NA			NA	NA			NA	NA			
Thallium	0.00	1.50E-07	1.00	0.002	92%	1.10E-08	0.90	0.000	8%	NA	1.37E-10			0.002
Vanadium	0.01	2.23E-05	1.00	0.003	58%	1.64E-06	0.10	0.002	42%	NA	2.04E-08			0.006
Zinc	0.30	3.00E-04	1.00	0.001	80%	2.20E-05	0.30	0.000	20%	NA	2.74E-07			0.001
Organics														
Acetone	0.10	1.06E-06	1.00	0.000	12%	7.82E-07	0.90	0.000	10%	3.50E-01	2.38E-05	0.000	78%	0.000
Benzene	NA	1.50E-08	1.00			1.10E-09	0.90			6.00E-03	2.47E-06	0.000	100%	0.000
Bromomethane (methyl bromide)	0.00	1.25E-09	1.00	0.000	2%	4.60E-10	0.90	0.000	1%	5.00E-03	1.78E-07	0.000	97%	0.000
Butyl benzylphthalate	0.20	2.25E-06	1.00	0.000	55%	1.66E-06	0.90	0.000	45%	NA	2.06E-09			0.000
Carbazole	NA	3.32E-07	1.00			2.44E-07	0.90			NA	3.03E-10			0.000
Carbon Disulfide	0.10	8.77E-09	1.00	0.000	2%	3.22E-09	0.90	0.000	1%	7.00E-01	2.39E-06	0.000	97%	0.000
Chlorobenzene	0.02	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	2.00E-02	0.00E+00	0.000	#DIV/0!	0.000
4-Chloro-3-methylphenol	NA	6.89E-06	NA			NA	NA			NA	6.29E-09			0.000
Dibenzofuran (unsubstituted)	0.00	1.57E-07	1.00	0.000	55%	1.15E-07	0.90	0.000	45%	NA	1.15E-07			0.000
Dibutyl phthalate	0.10	8.77E-08	1.00	0.000	55%	6.44E-08	0.90	0.000	45%	NA	8.01E-11			0.000
1,1 - Dichloroethane	0.10	6.89E-09	1.00	0.000	3%	2.53E-09	0.90	0.000	1%	5.00E-01	1.31E-06	0.000	96%	0.000
1,2 - Dichloroethylene (mixed isomers)	0.01	9.39E-06	1.00	0.001	2%	3.45E-06	0.90	0.000	1%	3.50E-02	1.64E-03	0.047	97%	0.048
Dichloromethane (methylene chloride)	0.06	0.00E+00	1.00	0.000	#DIV/0!	0.00E+00	0.90	0.000	#DIV/0!	3.00E+00	0.00E+00	0.000	#DIV/0!	0.000
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl)	0.02	2.76E-06	1.00	0.000	66%	1.01E-06	0.70	0.000	34%	NA	2.52E-09			0.000
Di - n - octyl phthalate	0.02	5.26E-08	1.00	0.000	55%	3.87E-08	0.90	0.000	45%	NA	4.77E-10			0.000
Ethyl benzene	0.10	4.51E-07	1.00	0.000	8%	1.66E-07	0.85	0.000	3%	1.00E+00	5.13E-05	0.000	89%	0.000

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker4. Summary of Exposure and Noncarcinogenic Risk Calculations

Chemical	Oral RfD (mg/kg-d)	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF(a)	Soil Ingestion HQ	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact HQ	% Total	Inhalation RfC (mg/m3)	Estimated Air Conc (mg/m3)	Inhalation HQ	% Total	Combined Pathway HQ
Methyl ethyl ketone (2-butanone)	0.60	1.32E-07	1.00	0.000	6%	9.67E-08	0.90	0.000	5%	1.00E+00	3.01E-06	0.000	88%	0.000
Methyl butyl ketone (MBK)(2-hexanone)	NA	1.63E-08	NA			NA	NA			NA	1.49E-11			
Methyl isobutyl ketone (MIBK)(4-methyl-2-pentanone)	0.08	9.39E-08	1.00	0.000	5%	3.45E-08	0.90	0.000	2%	8.00E-02	1.80E-06	0.000	93%	0.000
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	0.06	4.07E-07	1.00	0.000	24%	1.50E-07	0.80	0.000	11%	2.10E-01	3.79E-06	0.000	65%	0.000
Acenaphthylene	NA	4.76E-07	NA			NA	NA			NA	9.21E-07			
Anthracene	0.30	4.01E-07	1.00	0.000	52%	2.95E-07	0.80	0.000	48%	NA	3.59E-07			0.000
Benz[a]anthracene	NA	2.19E-06	1.00			2.09E-06	0.80			NA	2.00E-09			
Benzo[b]fluoranthene	NA	2.25E-06	1.00			2.15E-06	0.80			NA	2.06E-09			
Benzo[g,h,i]perylene	NA	5.14E-07	NA			NA	NA			NA	4.69E-10			
Benzo[k]fluoranthene	NA	8.14E-07	1.00			7.78E-07	0.80			NA	7.44E-10			
Benzo[a]pyrene	NA	1.06E-06	1.00			1.02E-06	0.80			NA	9.72E-10			
Chrysene	NA	1.06E-06	1.00			1.02E-06	0.80			NA	9.72E-10			
Dibenz[ah]anthracene	NA	2.50E-07	1.00			2.39E-07	0.80			NA	2.29E-10			
Fluoranthene	0.04	3.51E-06	1.00	0.000	46%	3.35E-06	0.80	0.000	54%	NA	3.20E-09			0.000
Fluorene	0.04	4.76E-07	1.00	0.000	41%	3.50E-07	0.80	0.000	38%	1.40E-01	8.40E-07	0.000	21%	0.000
Indeno[1,2,3-cd]pyrene	NA	6.89E-07	1.00			6.58E-07	0.80			NA	6.29E-10			
2-Methylnaphthalene	NA	6.26E-07	NA			NA	NA			NA	5.72E-10			
Naphthalene	0.04	1.44E-06	1.00	0.000	0%	5.29E-07	0.80	0.000	0%	1.00E-03	2.71E-05	0.027	100%	0.027
Phenanthrene	NA	3.13E-06	NA			NA	NA			NA	2.86E-09			
Pyrene	0.03	3.01E-06	1.00	0.000	51%	2.21E-06	0.80	0.000	47%	1.10E-01	3.41E-07	0.000	2%	0.000
PCBs (Polychlorinated Biphenyls)	0.00	2.76E-07	1.00	0.014	45%	3.04E-07	0.90	0.017	55%	NA	2.52E-10			0.031
Pentachlorophenol	0.03	3.13E-08	1.00	0.000	31%	5.75E-08	0.90	0.000	64%	2.00E-04	2.86E-11	0.000	4%	0.000
Phenol	0.60	7.51E-08	1.00	0.000	13%	4.42E-07	0.90	0.000	87%	NA	6.86E-11			0.000
Styrene	0.20	3.38E-08	1.00	0.000	2%	1.24E-08	0.90	0.000	1%	2.00E-01	1.59E-06	0.000	97%	0.000
Tetrachloroethylene (PCE)	0.01	4.76E-07	1.00	0.000	24%	1.75E-07	0.90	0.000	10%	4.00E-01	5.23E-05	0.000	66%	0.000
Toluene	0.20	6.26E-07	1.00	0.000	2%	2.30E-07	0.90	0.000	1%	4.00E-01	6.03E-05	0.000	97%	0.000
1,1,1 - Trichloroethane	0.04	3.51E-08	1.00	0.000	23%	1.29E-08	0.90	0.000	10%	1.00E+00	2.87E-06	0.000	67%	0.000
Trichloroethylene (TCE)	NA	6.89E-07	1.00			2.53E-07	0.90			NA	1.04E-04			
Xylenes (mixed)	2.00	4.57E-06	1.00	0.000	0%	1.68E-06	0.90	0.000	0%	3.00E-01	3.94E-04	0.001	100%	0.001

SCREENING HI = 0.646

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker5. Summary of Exposure and Carcinogenic Risk Calculations.

Chemical	Oral CSF (mg/kg-d)-1	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Inorganics														
Aluminum	NA	1.75E-03	1.00			1.29E-05	0.01			NA	1.60E-03			
Antimony	NA	7.60E-07	1.00			5.59E-09	0.05			NA	6.95E-07			
Arsenic	1.50	3.09E-06	1.00	4.63E-06	80%	6.81E-07	0.90	1.13E-06	20%	4.00E-03	2.82E-06	1.13E-08	0%	5.78E-06
Barium	NA	4.50E-05	1.00			3.30E-07	0.05			NA	4.11E-05			
Beryllium	NA	1.57E-07	1.00			1.15E-09	0.01			2.40E-03	1.43E-07	3.43E-10	100%	3.43E-10
Cadmium	NA	1.68E-07	1.00			1.23E-08	1.00			1.80E-03	1.53E-07	2.76E-10	100%	2.76E-10
Calcium	NA	1.04E-02	NA			NA	NA			NA	9.50E-03			
Chromium III	NA	2.04E-05	1.00			1.50E-06	0.05			NA	1.86E-05			
Chromium VI	NA	1.38E-04	1.00			1.02E-05	0.05			1.20E-02	1.26E-04	1.52E-06	100%	1.52E-06
Cobalt	NA	2.55E-06	1.00			1.87E-07	0.50			NA	2.33E-06			
Copper	NA	3.04E-04	1.00			2.24E-05	0.60			NA	2.78E-04			
Iron	NA	1.08E-02	NA			NA	NA			NA	9.89E-03			
Lead	NA	1.64E-04	NA			NA	NA			NA	1.50E-04			
Magnesium	NA	4.47E-03	NA			NA	NA			NA	4.09E-03			
Manganese	NA	5.57E-04	1.00			4.09E-06	0.05			NA	5.09E-04			
Mercury (inorganic)	NA	7.16E-08	1.00			2.63E-08	0.20			NA	9.47E-04			
Nickel	NA	7.49E-06	1.00			5.51E-07	0.05			4.80E-04	6.84E-06	3.29E-09	100%	3.29E-09
Potassium	NA	3.02E-04	NA			NA	NA			NA	2.76E-04			
Selenium	NA	2.91E-07	1.00			2.14E-08	0.90			NA	2.66E-07			
Sodium	NA	1.09E-04	NA			NA	NA			NA	9.95E-05			
Thallium	NA	5.37E-08	1.00			3.95E-09	0.90			NA	4.90E-08			
Vanadium	NA	7.96E-06	1.00			5.85E-07	0.10			NA	7.27E-06			
Zinc	NA	1.07E-04	1.00			7.87E-06	0.30			NA	9.79E-05			
Organics														
Acetone	NA	3.80E-07	1.00			2.79E-07	0.90			NA	8.51E-03			
Benzene	0.03	5.37E-09	1.00	1.56E-10	2%	3.95E-10	0.90	1.27E-11	0%	8.30E-06	8.82E-04	7.32E-09	98%	7.49E-09
Bromomethane (methyl bromide)	NA	4.47E-10	1.00			1.64E-10	0.90			NA	6.37E-05			
Butyl benzylphthalate	NA	8.05E-07	1.00			5.92E-07	0.90			NA	7.35E-07			
Carbazole	0.02	1.19E-07	1.00	2.37E-09	55%	8.71E-08	0.90	1.94E-09	45%	NA	1.08E-07			4.31E-09
Carbon Disulfide	NA	3.13E-09	1.00			1.15E-09	0.90			NA	8.54E-04			
Chlorobenzene	NA	0.00E+00	1.00			0.00E+00	0.90			NA	0.00E+00			
4-Chloro-3-methylphenol	NA	2.46E-06	NA			NA	NA			NA	2.25E-06			
Dibenzofuran (unsubstituted)	NA	5.59E-08	1.00			4.11E-08	0.90			NA	4.12E-05			
Dibutyl phthalate	NA	3.13E-08	1.00			2.30E-08	0.90			NA	2.86E-08			
1,1 - Dichloroethane	0.01	2.46E-09	1.00	1.40E-11	2%	9.04E-10	0.90	5.73E-12	1%	1.60E-06	4.67E-04	7.48E-10	97%	7.87E-10
1,2 - Dichloroethylene (mixed isomers)	NA	3.35E-06	1.00			1.23E-06	0.90			NA	5.86E-01			
Dichloromethane (methylene chloride)	0.01	0.00E+00	1.00	0.00E+00	#DIV/0!	0.00E+00	0.90	0.00E+00	#DIV/0!	4.70E-07	0.00E+00	0.00E+00	#DIV/0!	0.00E+00
Di(2 - ethylhexyl)phthalate (bis-ethylhexyl)	0.01	9.84E-07	1.00	1.38E-08	66%	3.62E-07	0.70	7.23E-09	34%	4.00E-06	8.99E-07	3.60E-12	0%	2.10E-08
Di - n - octyl phthalate	NA	1.88E-08	1.00			1.38E-08	0.90			NA	1.70E-07			
Ethyl benzene	NA	1.61E-07	1.00			5.92E-08	0.85			NA	1.83E-02			

Minor (0 -12) Construction/Utility Worker

Minor Construction/Utility Worker5. Summary of Exposure and Carcinogenic Risk Calculations.

Chemical	Oral CSF (mg/kg-d) ⁻¹	Soil Ingestion (mg/kg/d)	Soil Ingestion AAF	Soil Ingestion ECR	% Total	Dermal Contact (mg/kg/d)	Absorb Dose AF(b)	Dermal Contact ECR	% Total	Inhalation CSF (ug/m3)	Estimated Air Conc (ug/m3)	Inhalation ECR	% Total	Combined Pathway Total
Methyl ethyl ketone (2-butanone)	NA	4.70E-08	1.00			3.45E-08	0.90			NA	1.07E-03			
Methyl butyl ketone (MBK)(2-hexanone)	NA	5.81E-09	NA			NA	NA			NA	5.31E-09			
Methyl isobutyl ketone (MIBK)(4-methyl-2-pentanone)	NA	3.35E-08	1.00			1.23E-08	0.90			NA	6.42E-04			
PAHs (Polynuclear Aromatic Hydrocarbons)														
Acenaphthene	NA	1.45E-07	1.00			5.34E-08	0.80			NA	1.35E-03			
Acenaphthylene	NA	1.70E-07	NA			NA	NA			NA	3.29E-04			
Anthracene	NA	1.43E-07	1.00			1.05E-07	0.80			NA	1.28E-04			
Benz[a]anthracene	0.73	7.83E-07	1.00	5.71E-07	46%	7.48E-07	0.80	6.83E-07	54%	1.70E-04	7.15E-07	1.22E-10	0%	1.25E-06
Benzo[b]fluoranthene	0.73	8.05E-07	1.00	5.88E-07	46%	7.69E-07	0.80	7.02E-07	54%	1.70E-04	7.35E-07	1.25E-10	0%	1.29E-06
Benzo[g,h,i]perylene	NA	1.83E-07	NA			NA	NA			NA	1.68E-07			
Benzo[k]fluoranthene	0.07	2.91E-07	1.00	2.12E-08	46%	2.78E-07	0.80	2.54E-08	54%	1.70E-05	2.66E-07	4.51E-12	0%	4.66E-08
Benzo[a]pyrene	7.30	3.80E-07	1.00	2.78E-06	46%	3.63E-07	0.80	3.32E-06	54%	1.70E-03	3.47E-07	5.90E-10	0%	6.09E-06
Chrysene	0.01	3.80E-07	1.00	2.78E-09	46%	3.63E-07	0.80	3.32E-09	54%	1.70E-06	3.47E-07	5.90E-13	0%	6.09E-09
Dibenz[ah]anthracene	7.30	8.95E-08	1.00	6.53E-07	46%	8.55E-08	0.80	7.80E-07	54%	1.70E-03	8.17E-08	1.39E-10	0%	1.43E-06
Fluoranthene	NA	1.25E-06	1.00			1.20E-06	0.80			NA	1.14E-06			
Fluorene	NA	1.70E-07	1.00			1.25E-07	0.80			NA	3.00E-04			
Indeno[1,2,3-cd]pyrene	0.73	2.46E-07	1.00	1.80E-07	46%	2.35E-07	0.80	2.15E-07	54%	1.70E-04	2.25E-07	3.82E-11	0%	3.94E-07
2-Methylnaphthalene	NA	2.24E-07	NA			NA	NA			NA	2.04E-07			
Naphthalene	NA	5.14E-07	1.00			1.89E-07	0.80			NA	9.69E-03			
Phenanthrene	NA	1.12E-06	NA			NA	NA			NA	1.02E-06			
Pyrene	NA	1.07E-06	1.00			7.89E-07	0.80			NA	1.22E-04			
PCBs (Polychlorinated Biphenyls)	2.00	9.84E-08	1.00	1.97E-07	45%	1.08E-07	0.90	2.41E-07	55%	2.20E-03	8.99E-08	1.98E-10	0%	4.38E-07
Pentachlorophenol	0.12	1.12E-08	1.00	1.34E-09	33%	2.05E-08	0.90	2.74E-09	67%	3.40E-05	1.02E-08	3.47E-13	0%	4.08E-09
Phenol	NA	2.68E-08	1.00			1.58E-07	0.90			NA	2.45E-08			
Styrene	0.03	1.21E-08	1.00	3.62E-10	43%	4.44E-09	0.90	1.48E-10	18%	5.70E-07	5.70E-04	3.25E-10	39%	8.35E-10
Tetrachloroethylene (PCE)	0.05	1.70E-07	1.00	8.84E-09	65%	6.25E-08	0.90	3.61E-09	27%	5.80E-08	1.87E-02	1.08E-09	8%	1.35E-08
Toluene	NA	2.24E-07	1.00			8.22E-08	0.90			NA	2.15E-02			
1,1,1 - Trichloroethane	NA	1.25E-08	1.00			4.60E-09	0.90			NA	1.03E-03			
Trichloroethylene (TCE)	0.01	2.46E-07	1.00	2.71E-09	4%	9.04E-08	0.90	1.11E-09	2%	1.70E-06	3.73E-02	6.34E-08	94%	6.72E-08
Xylenes (mixed)	NA	1.63E-06	1.00			6.00E-07	0.90			NA	1.41E-01			

ECR = Excess Cancer Risk

TOTAL ECR = 1.84E-05

APPENDIX H

NORTH 40 REMOVAL ACTION REPORT

COMPLETION REPORT
FOR
REMOVAL ACTION AT NORTH 40

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0014
STATEMENT OF WORK #015
Task 1

REVISION 1
December, 1996

Prepared For:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
P.O. Box 190010
2155 Eagle Drive
North Charleston, South Carolina 29419-9010

Prepared By:

MORRISON KNUDSEN CORPORATION
2420 Mall Drive
Corporate Square 1 - Suite 211
North Charleston, South Carolina 29406

**COMPLETION REPORT
FOR
REMOVAL ACTION AT NORTH 40**

**NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA**

**Revision 1
December, 1996**

**CONTRACT N62467-93-D-1106
DELIVERY ORDER #0014
STATEMENT OF WORK #015
Task 1**

Prepared by:

**MORRISON KNUDSEN CORPORATION
2420 MALL DRIVE
CORPORATE SQUARE 1 - SUITE 211
NORTH CHARLESTON, SOUTH CAROLINA 29406**

PREPARED/APPROVED BY:



MK Project Manager

12/16/96
Date

APPROVALS:



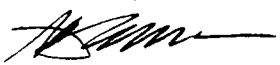
MK Safety and Health Program Manager

12/30/96
Date



MK Quality Program Manager

30 Dec - 96
Date



MK Sr. Project Manager

30 Dec 96
Date



MK Program Manager

30 Dec. 96
Date

CLIENT ACCEPTANCE

U.S. Navy Responsible Authority

Date

COMPLETION REPORT

NIROP NORTH 40 AREA Fridley, Minnesota

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APPENDIX B	Manifests for Hazardous Waste
APPENDIX C	Haz-Cat Analytical Results
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APPENDIX G	Project Correspondence

LIST OF DRAWINGS

DRAWING 1	North 40 Anomaly Excavation Drawing
DRAWING 2	North 40 Confirmation Soil Sample Locations

EXECUTIVE SUMMARY

Morrison Knudsen Corporation (MK) was contracted by Naval Facilities Engineering Command, Southern Division (SOUTHDIV) to conduct a removal action at the Naval Industrial Reserve Ordnance Plant (NIROP) located at 4800 East River Road, Fridley, Minnesota. The removal action was started on April 22, 1996, and completed on June 4, 1996.

The purpose of this project was to investigate suspected drum disposal sites, as identified in the *Work Plan for Removal Action at North Forty*, NIROP Fridley, Addendum to Rev. B, February 21, 1996 ("Work Plan"). These sites were located in an area referred to as the North 40. The Work Plan identified 9 "A" Anomalies and 5 "B" Anomalies that were suspected of containing drum sources of contaminants.

A total of 23 drums and 12 smaller containers were excavated during the removal action. Contents from 13 drums and 8 containers and contents were visually inspected, screened with a Photo Ionizing Detector (PID) and a Flame Ionization Detector (FID), and found suspect. Drum and container contents were sampled and analyzed, and the drums and contents overpacked for hazardous waste disposal at the Port Arthur (Texas) incinerator. In addition, 2 overpack drums of contaminated soil and 1 drum of personal protective equipment were disposed of as hazardous waste at the Port Arthur incinerator. The remaining 10 drums and 4 containers were visually inspected and screened with PID and FID, determined to be non-hazardous, and sent to the United Defense scrap metal recycle program, the soil contents were placed in roll-off boxes for disposal.

Approximately 100 cubic yards of soil and debris were removed and disposed of as non-hazardous waste from the anomaly excavations. These materials were segregated and stockpiled during excavations. The debris consisted of a mixture of trash, scrap metal, tires, construction and demolition rubble, metal casting waste, equipment parts and cast concrete structures. Analysis of the debris proved it to be non-hazardous, with the exception of asbestos material, in the form of transite siding, air cell, and paraffin containing asbestos, which was removed from anomaly A-4. Disposition of soil and debris was as follows:

- Excavated metal and tires were disposed of through the United Defense recycle program.

- Excavated metal casting waste, debris and non-hazardous materials were transported to the Pine Bend (Minnesota) Landfill for disposal.
- Excavated soils that were non-detect for contaminants of concern, as indicated by the PID and FID, were returned to the excavations.
- Excavated soils that had contaminants indicated by the PID or FID were sampled and analyzed for contaminants of concern. Those soils found to be below hazardous waste action levels were transported to the Pine Bend Landfill for disposal as special waste. Soils contained in, or associated with, drums or other containers that were found to be above hazardous waste action levels (Anomalies A-1, A-3 and A-5) were transported to Emelle, Alabama for disposition and consolidation, and subsequent incineration at Port Arthur, Texas.
- Excavated asbestos material was disposed of as asbestos waste at the Voyager Landfill, Canyon, Minnesota.
- The Quality Assurance Project Procedure (QAPP) outlined objectives for completeness, representativeness, and comparability of the analytical quality assurance objectives. These objectives are believed to have been met and all data concerning the Fridley Anomaly Bottom Information Samples is believed to be acceptable.

Conclusion/Recommendations

Fourteen anomalies identified in the Work Plan, plus one additional area encountered during field operations, were excavated. Drums were found in four of the largest "A" anomalies. All excavated anomalies contained scrap metal. Six of the fourteen anomalies contained construction debris, metal casting waste, tires, and concrete structures or rubble, in various quantities. No drums were found in any of the "B" anomalies. Therefore, based on section 1.3.2 of the *Work Plan for Removal Action at the North Forty*, Addendum February 21, 1996, the Navy's position is that the Removal Action in the NIROP North 40 is complete and that no further drum removal actions are warranted.

1 INTRODUCTION

This report describes the removal actions performed in the area designated as the North 40 of The Naval Industrial Reserve Ordnance Plant (NIROP) Fridley, Minnesota, from April 22, 1996 to June 4, 1996. The Work Plan for Removal Action for North Forty, Addendum to Revision B, dated February 21, 1996 was prepared by Morrison Knudsen Corporation (MK) for SOUTHDIR, pursuant to the results of a geophysical investigation completed in June 1995. The results of the geophysical investigation were published in the report "Geophysical Investigation of the North 40 Site at NIROP Fridley, July 1995".

The geophysical investigations consisted of electromagnetic measurements using the EM31, EM34 and EM61 instruments to obtain data on ground conductivity and locate areas containing buried debris. Results of the electromagnetic surveys clearly delineated areas containing metallic utilities, above and below ground structures, as well as anomalies suspected to contain buried drums.

Based on the results of the geophysical investigations, 9 primary anomalous areas (A-1 through A-9) were identified as the most likely to contain drum-size metallic debris. These areas were excavated to determine the type of material buried and to remove any potential contaminating source. Five, of 42 smaller anomalies, (B-5, B-11, B-12, B-28 and B-30) were excavated to determine the cause of the anomalies and investigate the possibility of drummed contaminants. Additionally, one area of concern was excavated, at the direction of the Minnesota State Pollution Control Agency (MPCA), in the approximate location of anomaly B-20, to investigate suspected contaminated soils. [MPCA letter dated May 16, 1996 (copy in Appendix G), and Drawing 1 - Anomaly Excavation Drawing].

1.1 SITE DESCRIPTION

NIROP Fridley, is located near the Twin Cities of Minneapolis and St. Paul, Minnesota. The facility began producing Naval guns in 1941. The plant has diversified into the production of guided missile launching systems, various weaponry and electric power drive and control systems. The facility encompasses 83 acres of which 56 of those acres are under roof. The facility is presently operated by United Defense, Limited Partnership.

The facility is located less than 1 mile south of Interstate 694 and approximately 1,000 feet east of the Mississippi River. The site is located on a broad flat outwash terrace and is largely covered by pavement and buildings. The North 40 site is located in the northern sector of NIROP Fridley, between buildings 37 and 50, and encompasses approximately 22 acres.

1.2 SITE HISTORY

Historical aerial photographs of the North 40 show the area used by NIROP for storage of equipment, vehicles, manufacturing materials and containers, including 55-gallon drums, from the mid 1940's to the late 1980's. It was also reported that debris and plant excess had been buried in the North 40 during this same period.

Previous geophysical studies and remedial actions have been performed in the North 40 during the past 10 years. Records indicate that the U.S. Army Corps of Engineers performed a drum removal action during 1983 and 1984 in which 43 drums were excavated and removed. Baywest also performed a drum removal action in 1992, where 31 drums were excavated and removed.

2 QUALITY CONTROL

Quality Control for the removal action associated with NIROP Fridley North 40, Delivery Order No. 0014, Statement of Work No. 015, Task 1, was carried out in two primary areas.

- Work activities performed under the Quality Control Plan (QCP).
- Sampling and analyses quality requirements performed under the Chemical Data Acquisition Plan (CDAP).

2.1 QUALITY CONTROL PLAN

The Quality Control Plan (QCP) was structured to implement the procedures necessary to maintain a consistently high level of quality in the drum removal and soil sampling activities performed. Consistency was achieved through the standardization and thorough documentation of field techniques and activities for each definable feature of the work. Records generated from analytical sampling activities are referred to as Quality Records and have been processed in accordance with the requirements of the QCP.

The QCP integrated the Navy's Quality Control system of *Three Phases of Control*, Preparatory, Initial and Follow-up, which define a logical and systematic approach to assure the control of quality during the removal action work process.

2.2 CHEMICAL DATA ACQUISITION PLAN

Section III of the Chemical Data Acquisition Plan (CDAP) established the precision, accuracy, representativeness, completeness and comparability requirements of environmental monitoring and measurement data associated with the requirements of this program.

All Anomaly Bottom Information Samples (ABIS) were classified Contract Laboratory Program (CLP) Level QC or Level D, per NEESA 20.2-047B. All other analytical sampling at NIROP Fridley North 40 (drum samples, waste characterization, etc) was classified as Level E per NEESA 20.2-047B.

The CDAP also provided requirements for field sampling and testing, and provided the details for decontamination of sampling equipment, sample packaging and preservation, transportation, sample numbering, chain of custody and documentation requirements. EPA SW-846 Methods were used for the analytical protocol of this remedial action. Duplicate samples were used to develop estimates of accuracy and precision of the analytical data.

2.3 DATA ASSESSMENT SUMMARY

Fifty eight Disposal and Informational Samples taken for NIROP Fridley were analyzed for Volatiles, Semi-Volatiles, Phenols, Toxicity, Sulfate, Cyanide, Metals and PCB's. Four trip blanks were collected and analyzed to ensure the integrity of the sampling program and assist in the evaluation of storage and shipping conditions. Results of these field quality control samples did not indicate the presence of any target analytes above the reporting limits.

Data has been reviewed to determine whether data quality objectives were met for the sampling and analytical programs. Most method blanks were free of target compounds above the reporting limits, although one soil method blank, which corresponded to the samples taken on May 13, 1996, contained Zinc at a low level. Corresponding samples were flagged appropriately. Surrogates were run for volatiles, semi-volatiles and PCB analyses; most surrogate recoveries were within acceptable ranges to meet the project data quality objectives. In cases where the surrogate recoveries did not meet lab criteria, the samples were rerun with similar results, indicating matrix interferences.

Laboratory standard spikes had acceptable recoveries and acceptable precision between recoveries for most samples. Several volatile and semi-volatile results were slightly out of range, but in these instances the sample matrix spike and matrix spike duplicate (MS/MSD) results usually met the established acceptable criteria. For the seven batches of phenol analyses run, three sets of MS/MSD's had low recoveries. These runs had acceptable laboratory control spike recoveries, and all calibration was in control; it was suspected that matrix interferences occurred. MS/MSD precision and accuracy for metals met criteria established for the standard spike recoveries, except for Antimony, which often had slightly low recoveries. Corresponding samples were flagged accordingly. Of the ten batches of semi-volatiles that were run, two batches had low recoveries for the acid surrogates and target analyte spikes, which were replicated when the samples were re-run. Since

the laboratory spike recoveries, as well as the calibration for these runs were in control, matrix interferences were indicated. All other matrix spike recoveries, as well as the precision between recoveries, were acceptable.

The QAPP outlined objectives for completeness, representativeness, and comparability. These objectives are believed to have been met and all analytical data concerning the Fridley Removal Action is believed to be acceptable.

3 METHODOLOGY

The removal actions at the North 40 were performed using an observational approach based upon the results of the geophysical investigation conducted in June 1995. The principal feature of the observational approach is the explicit recognition of uncertainty and the ability to deal with the uncertainty in a systematic manner to reduce risk, project time and costs. The main advantage of this approach is that it allows the removal action to proceed based on current knowledge of site conditions without the need to collect additional site data and perform detailed design.

3.1 FIELD PREPARATIONS

Site preparatory work was the first physical activity on the site and involved the mobilization and staging of office trailers and equipment, utility installation, demarcation of work zones and screening the site for underground utilities.

The original survey grid used to conduct the geophysical survey was duplicated and physically marked with lathe and flagging. The location of each anomaly was marked on the ground with marking paint prior to the onset of excavation operations. The electromagnetic target was also marked with an "X" to identify suspected positions of buried objects.

As specified in the Health and Safety Plan, the work zone and access routes were established within the North 40 area. The configuration of specific exclusion areas and location of contamination reduction zones were developed one to two days prior to excavation operations, and implemented 12 to 24 hours prior to excavation operations.

3.2 EXCAVATION OPERATIONS

An exclusion zone was set up around each anomaly to minimize any accidental spread of hazardous substances by workers from the contaminated excavation. Soil within the anomalies was carefully excavated with a trackhoe until obstructions were encountered. The use of a metal detector for identifying suspected drums was not feasible due to the high content of scrap metal in the soil. When objects were encountered during the excavation, the trackhoe would proceed with extreme caution until the object could be identified. When drums were encountered, both the drum

and surrounding soil was excavated and placed in a designated staging area for investigation and dispositioning. Photographs of the excavations can be found in Appendix A.

Personnel working within the exclusion zone dressed in Level C, in accordance with the Health and Safety Plan, due to the unknown nature of the objects and materials being excavated. Level B PPE was used by personnel when sampling the contents of 55-gallon drums.

All excavated soils, both suspect and non-suspect, were stockpiled separately on 6-mil polyethylene liner within the exclusion zone. Field screening of soils was performed using portable PID and FID analyzers. Soils determined to be suspect were covered with 6-mil polyethylene liner and bermed with clean soil while awaiting laboratory analytical results.

3.3 FIELD VARIATIONS TO THE WORK PLAN

The Work Plan anticipated that any drums containing solvents or Constituents of Concern would be intact, or at least not crushed. Only one drum was found intact with contents in the drum, twenty two other drums recovered were crushed and empty of all free liquids. These twenty two drums contained soil which was screened with a PID and an FID. In accordance with the Work Plan, if the PID and/or FID readings were zero then further testing was not warranted and the contents were assumed to not be a Constituent of Concern. The contents of all drums and containers were dispositioned as shown in Table 1 and Table 2.

Asbestos containing material (ACM) in the form of transite panels, aircell, and mixed with paraffin sludge, was removed from anomaly A-4. The asbestos material was removed and disposed of by Envirobate Remediation Inc., a State of Minnesota approved asbestos contractor.

3.4 RESTORATION

After all anomalies were excavated and Anomaly Bottom Information Samples (ABIS) taken, non-suspect stockpiled soil was used to backfill respective excavations. All stockpiles of excavated soils that were considered suspect, due to their proximity to discovered drums or discolored soils, were sampled and analyzed for Constituents of Concern. The use of suspect soils for backfill was predicated on the laboratory

analytical results. Approximately 10 cubic yards of suspect soil was determined to contain contaminants at low concentrations and were subsequently disposed of as special waste. Analytical test results for all other suspect soil samples indicated that constituents of concern were below detection levels. Therefore all suspect stockpiled soil, other than that disposed of as special waste, was used for backfill. Anomaly A-2 was the only excavation which required imported backfill due to the removal of metal casting waste and debris. All excavations were backfilled and compacted in 18 inch lifts to 95% (minimum) relative density for structural fill areas and 85% (minimum) relative density in non-critical areas. See Appendix F for compaction testing results.

4.0 REMEDIATION/FINDINGS

A total of twenty three (23) 55-gallon drums and 12 smaller containers were found in 4 of the 15 excavated anomalies. All drums and containers were found within the top six feet of the ground surface. Drums containing hydrocarbon product, solvent, suspect material or contaminated soil were found in 3 of the 15 excavated anomalies. One additional anomaly contained drums which were determined to be non-hazardous.

- Anomaly A-1 yielded 1 drum containing contaminated soil and 6 drums determined to be non-hazardous.
- Anomaly A-2 yielded 4 drums determined to be non-hazardous.
- Anomaly A-3 yielded 1 drum containing hazardous waste, 7 drums containing contaminated soil, 1 drum determined to be non-hazardous, and 4 one-gallon containers which were determined to be non-hazardous.
- Anomaly A-5 yielded 3 drums of contaminated soil and 8 quart-size containers containing ingredients such as brake fluid and paint thinner which were disposed of as hazardous waste.

All contents from excavated drums and containers were screened with the PID and FID for constituents of concern. 10 drums and 4 containers, found to be clean by non-detection of the PID or FID, had their contents removed and were disposed of as scrap metal by the United Defense metal recycling program. Soils from these 10 drums and 4 containers were placed in roll-offs for disposal as Special Waste.¹ The remaining 13 drums and 8 containers, with contents, that showed indications of contaminants were sampled for Hazardous Cataloging (Haz-Cat) and disposal analysis, and placed in steel or poly overpack drums for storage and transport. All 13 drums and 8 containers were sent to Emelle, Alabama, for disposition and subsequent incineration at Port Arthur, Texas. Excavated soils surrounding 1 of the drums from anomaly A-3 was placed in 2 steel overpacks, due to high VOC reading during screening, and also sent to Port Arthur, Texas, via Emelle, Alabama.

The excavation of anomaly A-4 encountered asbestos in the form of transite siding, aircell insulation and paraffin sludge. Approximately 12 cubic yards of asbestos

materials were containerized and removed from the site and disposed of at the Voyager Landfill, Canyon, Minnesota, a licensed asbestos disposal facility.

Approximately 7,495 cubic yards of soil and debris were excavated from the North 40. Of this, approximately 100 cubic yards of soil and debris, unsuitable for use as backfill, were disposed of at the Pine Bend Landfill, Minnesota, a special waste disposal facility.

Six large concrete objects were discovered during anomaly excavations. A-2 contained three solid concrete blocks, measuring approximately 6 feet on each side. B-12 contained a single reinforced concrete structure, measuring approximately 6 feet wide by 8 feet deep. As the structure in B-12 was not fully excavated the third dimension is not known, however it is believed to be the abandoned base of a light tower. A-3 and A-4 each contained one cylindrical concrete gun mount.² These were approximately 10 feet in diameter. As the gun mounts were not fully excavated, the length is not known. In all cases the concrete objects were too massive for removal, and therefore were reburied in place as directed by the MPCA. Locations are noted on Drawing 2. Metal objects or debris were always found at or very near the "X", representing geophysical electromagnetic targets, during the excavation of the anomalies.

Soil samples were collected by Morrison Knudsen from the bottom of each excavation after all drums and/or materials were removed and prior to backfilling. A minimum of two samples were collected from the bottom of each excavation and analyzed for VOC's, SVOC's, TOX/TOH, Phenolics, Total Cyanide, Sulfur and Metals. Soil samples were collected in the approximate center of each 1/2 or 1/3 area comprising the bottom of the excavation. Analytical data from the Anomaly Bottom Information Samples (designated ABIS), taken from the bottom of each excavated anomaly, are tabulated and summarized in Table 4. As the ABIS were taken for informational purposes only, no remedial action was undertaken as a result of the ABIS analytical data. The laboratory analytical results may be found in Appendix E.

¹ Special Waste consisted of materials having volatiles indicated by PID or FID, but having TCLP results below Hazardous Levels as mandated in 40 CFR 261.

² In Anomaly A-3 it should be noted that although 55-gallon drums were found in the anomaly they were not buried near, or physically associated with, the concrete gun mount.

5.0 CONCLUSION/RECOMMENDATIONS

Based on how well the results of this removal action correlated with the prediction of the Geophysical Report (July 1995) the Navy and Morrison Knudsen believes that all targets capable of containing contaminants have been excavated. Buried drums were found in four of the nine "A" anomalies. Five of the most suspect "B" anomalies were also excavated to determine the cause of the anomaly. Metal rubble was determined to be the targets of all the "B" Anomalies. No drums or containers were found in any of the "B" anomalies.

Therefore, based on section 1.3.2 of the *Work Plan for Removal Action at the North Forty*, Addendum February 21, 1996, the Navy's position is that the Removal Action in the NIROP North 40 is complete and that no further drum removal actions are warranted.

TABLE 1
DISPOSITION OF RECOVERED 55-GALLON DRUMS (D)

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
D1	A-1	Open Top 55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS1	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS1
D2	A-1	55-Gallon Drum w/Contents	Drum and Contents to Overpack D2	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\A5-DISP2
D3	A-1	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) DP1	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS1
D4	A-1	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS1	Drum to Scrap Metal	Drum Was Empty PID = 0	See DP1
D5	A-1	Empty 55-Gallon Drum	None	Drum to Scrap Metal	Drum Was Empty PID = 0	N/A
D6	A-1	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS1	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS1
D7	A-1	Empty 55- Gallon Drum	None	Drum to Scrap Metal	Drum Was Empty PID = 0	N/A
D8	A-2	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS8	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS8
D9	A-2	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS8	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS8
D10	A-2	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS8	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS8

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
D11	A-2	55-gallon Drum w/Soil	Drum Emptied Contents & Adjacent Soil to (Soil Stockpile) SS8	Drum to Scrap Metal	Drum Was Empty PID = 0	See SS8
D12	A-5	55-Gallon Drum w/Contents	Drum and Contents to Overpack D12	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\A5-DISP3
D13	A-5	55-Gallon Drum w/Contents Adjacent Soils to SS3 & SS4	Drum and Contents to Overpack D13	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\A5-DISP2
D14	A-5	55-Gallon Drum w/Contents Adjacent Soils to SS2 & SS4	Drum and Contents to Overpack D14	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\A5-DISP2
D15	A-5	8 Quart Paint Cans w/Contents	Cans and Contents to Overpack D15	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\A5-DISP2
D16	A-3	30-gallon Container w/Contents	Drum and Contents to Overpack D16	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D17	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D17	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D18	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D18	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D19	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D19	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D20	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpacks D20, D21 & D22	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D21	A-3	Additional Soil From Around D20	Overpacks D21	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D22	A-3	Additional Soil From Around D20	Overpacks D22	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D23	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D23	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
D24	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D24	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D25	A-3	55-gallon Drum w/Soil	Drum and Soil to Overpack D25	Drum to Scrap Metal Soil to A-3 Backfill	PID = 0 Haz-Cat = 0	N/A
D26	A-3	55-gallon Drum w/Contents	Drum and Contents to Overpack D26	Emelle, Alabama July 25, 1996	PID Indicated Haz-Cat Indicated	FRI\SA3-DISP4
D27	A-3	4 Gallon Cans w/Soil	Cans to Overpack D27	Cans to Scrap Metal Soil to A-3 Backfill	PID = 0 Haz-Cat = 0	N/A
D28	All	PPE	Overpack D28	Emelle, Alabama July 25, 1996	N/A	N/A

TABLE 2
DISPOSITION OF SOIL STOCKPILES (SS)

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
SS1	A-1	Soils From Inside and Around Drums D1, D4 and D6	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\A1-SS-DISP FRI\SA1-DISP2
SS2	A-5	Soils From Inside and Around Drum D14	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\A5-SS-DISP2
SS3	A-5	Soils From Inside and Around Drum D13	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\A5-SS-DISP
SS4	A-5	Soils From Inside and Around Drums D13 and D14	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\A5-SS-DISP
SS5	A-5	A-5 Excavation Stockpile Sample Split with MPCA	None	Soil Returned to Anomaly A-5	PID = 0 Haz-Cat = 0 Analysis = 0	FRI\SA5-SCS-33 FRI\SA5-SCS-36
SS6	A-5	Soils From Inside and Around Drum D15	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\A5-SS-DISP
SS7	A-5	A-5 Excavation Stockpile Sample Split with MPCA	None	Soil Returned to Anomaly A-5	PID = 0 Haz-Cat = 0 Analysis = 0	FRI\SA5-SCS-32 FRI\SA5-SCS-34
SS8	A-2	Soils From Inside and Around Drums D8, D9, D10, and D11	None	Soil Returned to Anomaly A-2	PID = 0 Haz-Cat = 0	N/A

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
SS9	A-5	A-5 Excavation Stockpile Sample Split with MPCA	None	Soil Returned to Anomaly A-5	PID = 0 Haz-Cat Indicated Analysis = 0	FRI\SA5-SCS-35
SS10	A-3	Soils From Around Drum D15	Soil placed in Stockpile SS11	See SS11	N/A	N/A
SS11	A-3	Soils From Inside and Around Drums D16, D17, D18 and SS10 Contents	Soil Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat Indicated	FRI\SA3-DISP1 FRI\SA3-DISP5

**TABLE 3
DISPOSITION OF DEBRIS (DP)**

ITEM DESIGNATION	ANOMALY	DESCRIPTION	ON-SITE RE-PACKAGING	OFF-SITE DISPOSITION	BASIS FOR DISPOSITION	SAMPLE NUMBERS
DP1	A-1	Soils and Debris from Inside and Around Drums D1 and D3	Materials Placed in Roll-Off Box	Pine Bend Landfill August 9, 1996	PID = 0 Haz-Cat = 0	FRI\A1-SS-DISP
DP2	A-1	Roofing Tar, Wood Scrap and General Debris	Materials Placed in Roll-Off Box	Pine Bend Landfill June 4, 1996	PID = 0 Haz-Cat = 0	N/A
DP3	A-5	8 Empty Cans and Adjacent Soil	Repackaged as D15	Emelle, Alabama Incineration	PID = 0 Haz-Cat Indicated	See D15
DP4	A-2	Metal Casting Waste and Metal Debris	Materials Placed in 3 Roll-Off Boxes	Pine Bend Landfill August 8 and 9, 1996	PID = 0 Haz-Cat = 0	FRI\SA2-DISP2
DP5	A-3	19 Tires	Secured to Pallets	Recycled Through United Defense	PID = 0	N/A
DP6	A-4	Steel Vat with Asbestos Sludge	Asbestos Removed by EnviroBate Vat to Scrap Metal	Asbestos Materials to Voyager Landfill Canyon, MN.	PID = 0 Haz-Cat Indicated	N/A
N/A	ALL	18.28 Tons of Recovered Metal Materials	Material Placed in Roll-Off Boxes	Recycled Through United Defense	PID = 0	N/A

TABLE 4
Anomaly Bottom Information Sample (ABIS) Summary

Data Qualifiers:

- H Indicates at least one species was detected above the quantitation limit. If more than one species were detected, the reported values are shown in the footnotes. This qualifier only applies to the organic analyses.
 U Indicates compound was analyzed for but not detected.
 J Indicates an estimated value was detected below the quantitation limit. Estimated values are shown in the footnotes for the detected species. This qualifier applies only to the organic analyses.
 B Indicates a reported value was obtained from a reading that was less than the Contract Required Detection Limit but greater than or equal to the Instrument Detection Limit. This qualifier only applies to the inorganic analyses.

Sample No.	Location	Description	Analyses															
			VOCs µg/kg	SVOCs µg/kg	TOH/TOX mg/kg	Phenolics mg/kg	Cyanide (Total) mg/kg	Sulfur (Sulfate) mg/kg	Antimony mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/l g	Lead mg/kg	Mercury mg/kg	Nickel mg/kg	Silver mg/kg	Zinc mg/kg
SA1-SCS-01	A1	Middle of excavation	U	U J ¹	U	U	U	475	U	8.4	B 0.08	9.1	4.1	B 1.2	U	10	U	12.0
SA1-SCS-02	A1	West end	U	U	U	U	U	2,090	U	8.4	B 0.06	5.2	2.8	11.8	U	6.0	U	9.4
SA1-SCS-03	A1	East end	U	U J ²	U	U	U	1,100	U	65.9	B 0.31	11.6	17.0	23.2	U	16.6	U	37.6
SB28-SCS-04	B28	South end	U	U	12.5	U	U	291	U	5.7	B 0.07	2.3	B 2.1	B 1.6	U	12.2	U	8.1
SB28-SCS-05	B28	North end	U	U	U	U	U	194	U	7.1	B 0.07	8.0	11.4	B 1.2	U	10.2	U	12.3
SB30-SCS-06	B30	North end	U	U	U	U	U	669	U	4.2	U	4.6	B 2.0	B 0.99	0.04	5.6	U	6.9
SB30-SCS-07	B30	South end	U	U J ³	U	U	U	690	U	6.4	U	3.8	B 2.6	B 2.1	U	5.1	U	8.1
SA10-SCS-08	A1	Dup. of SA1-SCS-01	U	U	U	U	U	854	U	6.1	B 0.04	4.8	B 2.5	B 1.1	U	5.9	U	8.4
SA7-SCS-09	A7	West end	U	U	U	U	U	8.53	U	11.8	B 0.05	4.0	B 1.7	1.2	U	5.7	U	9.3
SA7-SCS-10	A7	East end	U	U	U	U	U	5.65	U	8.6	U	5.1	3.2	2.5	U	4.3	U	11.1
SA8-SCS-11	A8	East end	U	U J ⁴	U	U	U	14	U	3.0	U	3.1	B 1.8	0.93	U	B 4.0	U	8.3
SA8-SCS-12	A8	1/3 in from east end	U	U	U	U	U	6.71	B 0.31	3.8	B 0.06	4.0	2.4	1.4	U	5.7	U	8.2
SA8-SCS-13	A8	West end	U	U	U	U	U	8.4	U	4.2	B 0.05	4.0	B 1.8	1.1	U	4.8	U	8.0
SB5-SCS-14	B5	South end	U	U J ⁵	U	U	U	6.29	U	5.5	U	4.3	2.5	1.5	U	5.6	U	8.2
SB5-SCS-15	B5	North end	U	U	14.3	U	B 0.14	10.5	U	7.5	U	5.3	B 2.2	1.5	U	4.5	U	7.8
SB11-SCS-16	B11	South end	U	U	U	U	U	6.75	U	3.3	U	3.8	B 1.6	0.91	U	4.6	U	7.3
SB11-SCS-17	B11	North end	U	U	U	U	U	6.17	U	8.6	B 0.04	5.6	2.6	1.4	U	6.4	U	9.9
SB12-SCS-18	B12	East end	U	U	U	U	U	5.83	U	6.0	B 0.04	5.1	3.3	1.3	U	6.2	U	10.3
SB12-SCS-19	B12	West end	U	U J ⁶	U	U	B 0.13	9.98	U	15.6	B 0.08	5.6	7.3	11.3	U	6.1	U	20.3
SA10-SCS-20	B12	Dup. of SB12-SCS-19	U J ⁷	U J ⁸	U	U	U	6.59	B 0.55	14.9	B 0.11	6.9	8.3	16.3	U	7.5	U	21.1
SA6-SCS-21	A6	East end	U J ⁹	U	U	U	U	4.14	U	6.9	B 0.04	4.2	2.4	1.3	U	5.6	U	12.2
SA6-SCS-22	A6	West end	U	H ¹⁰ U J ¹¹ (see note 10)	U	U	B 0.16	15.5	U	26.2	B 0.22	8.2	292	20.4	U	14.7	U	53.2
SA5-SCS-23	A5	East end	U J ¹²	U	U	U	U	518	U	7.4	B 0.07	8.0	4.8	B 2.1	U	10.0	U	11.3
SA5-SCS-24	A5	1/3 in from east end	H ¹³ U J ¹⁴	13	U	U	U	844	U	5.7	B 0.06	8.9	4.1	B 1.5	U	8.7	U	9.1
SA5-SCS-25	A5	West end	U J ¹⁵	U J ¹⁶	U	U	U	676	U	5.4	B 0.07	7.3	3.9	B 1.7	U	7.6	U	10.6
SA10-SCS-26	A5	Dup. of SA5-SCS-24	U	U	U	U	U	629	U	7.4	B 0.06	11.2	4.8	B 1.5	U	10.9	U	11.9
SA2-SCS-27	A2	SE Quadrant	U	U	U	U	U	1,820	U	3.9	B 0.08	5.0	3.7	B 1.6	U	9.1	U	7.5
SA2-SCS-28	A2	East end	U J ¹⁷	U	U	U	U	1,010	U	11.2	B 0.10	6.2	7.4	B 2.4	U	11.4	U	14.2
SA2-SCS-29	A2	West end	U J ¹⁸	U	U	U	U	216	U	5.2	U	4.3	B 2.5	B 1.2	U	5.8	U	8.4
SA9-SCS-30	A9	West end	U	U	U	U	U	74	U	151	B 0.13	5.7	2.9	B 2.0	U	9.8	U	9.5
SA9-SCS-31	A9	East end	U	U	U	U	U	106	U	261	B 0.08	5.4	3.4	B 2.0	U	8.9	U	10.9
SB20-SCS-37	B20	East end	U	U	U	U	U	59.3	U	4.0	B 0.05	3.0	B 1.3	B 1.1	U	B 3.5	U	6.0
SB20-SCS-38	B20	West end	U	U	U	U	U	247	U	10.4	B 0.04	3.5	8.1	B 1.5	U	9.9	U	11.7
SA3-SCS-40	A3	East end	H ¹⁹ U J ²⁰	110	U	U	B 0.16	497	U	10.8	B 0.39	4.5	3.5	B 4.3	U	6.0	U	14.6

TABLE 4
Anomaly Bottom Information Sample (ABIS) Summary

Data Qualifiers:

- H Indicates at least one species was detected above the quantitation limit. If more than one species were detected, the reported values are shown in the footnotes. This qualifier only applies to the organic analyses.
- U Indicates compound was analyzed for but not detected.
- J Indicates an estimated value was detected below the quantitation limit. Estimated values are shown in the footnotes for the detected species. This qualifier applies only to the organic analyses.
- B Indicates a reported value was obtained from a reading that was less than the Contract Required Detection Limit but greater than or equal to the Instrument Detection Limit. This qualifier only applies to the inorganic analyses.

Sample No.	Location	Description	Analyses															
			VOCs µg/kg	SVOCs µg/kg	TOH/TOX mg/kg	Phenolics mg/kg	Cyanide (Total) mg/kg	Sulfur (Sulfate) mg/kg	Antimony mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Metals					
													Copper mg/kg	Lead mg/kg	Mercury mg/kg	Nickel mg/kg	Silver mg/kg	Zinc mg/kg
SA10-SCS-41	A10	Dup. of SA5-SCS-40	H ²¹ U (see note 21)	U J ²²	U	U	U	592	U	15.1	B 0.08	6.3	6.9	B 3.0	U	6.5	U	14.4
SA3-SCS-42	A3	West end	U J ²³	U	U	U	B 0.18	407	U	5.7	B 0.10	3.1	2.9	B 1.5	U	5.8	U	9.9
SA4-SCS-43	A4	East end	U	U J ²⁴	U	U	U	735	U	12.7	U	3.9	B 2.3	B 1.7	U	B 3.7	U	7.0
SA4-SCS-44	A4	West end	U	U J ²⁵	U	U	U	511	U	3.9	U	2.5	B 1.7	B 0.86	U	4.5	U	5.5

Notes:

- ¹ SA1-SCS-01 SVOCs estimated quantities in µg/kg: Pyrene=27; Benzo(b)fluoranthene=24
- ² SA1-SCS-03 SVOCs estimated quantity in µg/kg: Benzo(b)fluoranthene=29
- ³ SB30-SCS-07 SVOCs estimated quantities in µg/kg: Pyrene=82; Benzo(a)anthracene=39; Chrysene=47; Benzo(b)fluoranthene=47; Benzo(k)fluoranthene=45; Benzo(a)pyrene=36; Indeno(1,2,3-cd)pyrene=18
- ⁴ SA8-SCS-11 SVOCs estimated quantities in µg/kg: Pyrene=28
- ⁵ SA5-SCS-14 SVOCs estimated quantity in µg/kg: 2-Chlorophenol=24; 4-Chloro-3-Methylphenol=20; Pentachlorophenol=30
- ⁶ SB12-SCS-19 SVOCs estimated quantity in µg/kg: Pyrene=31; Benzo(a)anthracene=22; Chrysene=29; Benzo(a)pyrene=22
- ⁷ SA10-SCS-20 VOCs estimated quantity in µg/kg: Trichloroethene=1
- ⁸ SA10-SCS-20 SVOCs estimated quantity in µg/kg: Pyrene=65; Benzo(a)anthracene=36; Chrysene=39; Benzo(k)fluoranthene=32; Benzo(a)pyrene=28; Indeno(1,2,3-cd)pyrene=22
- ⁹ SA6-SCS-21 VOCs estimated quantities in µg/kg: 1,2-Dichloroethene (total)=3; Trichloroethene=2
- ¹⁰ SA6-SCS-22 Hits on VOCs were observed (in µg/kg) for Pyrene=2100; Benzo(a)anthracene=920; Chrysene=1000; Benzo(b)fluoranthene=940; Benzo(k)fluoranthene=800; Benzo(a)pyrene=980; Indeno(1,2,3-cd)pyrene=880
- ¹¹ SA6-SCS-22 SVOCs estimated quantity in µg/kg: Acenaphthene=65; Carbazole=110; Dibenz(a,h)anthracene=260
- ¹² SA5-SCS-23 SVOCs estimated quantities in µg/kg: 1,2-Dichloroethene (total)=2; Trichloroethene=2
- ¹³ SA5-SCS-24 Hit on VOCs was observed for 1,2-Dichloroethene (total) = 13 µg/kg.
- ¹⁴ SA5-SCS-24 VOCs estimated quantity in µg/kg: Trichloroethene=8
- ¹⁵ SA5-SCS-25 VOCs estimated quantity in µg/kg: 1,2-Dichloroethene (total)=3
- ¹⁶ SA5-SCS-25 SVOCs estimated quantities in µg/kg: Pyrene=30; Chrysene=22
- ¹⁷ SA2-SCS-28 VOCs estimated quantity in µg/kg: Trichloroethene=3
- ¹⁸ SA2-SCS-29 VOCs estimated quantity in µg/kg: Trichloroethene=10
- ¹⁹ SA3-SCS-40 Sample hit of VOCs was observed for Trichloroethene=110 µg/kg.
- ²⁰ SA3-SCS-40 VOCs estimated quantity in µg/kg: 1,2-Dichloroethene(total)=9
- ²¹ SA10-SCS-41 Hits on VOCs were observed for 1,2-Dichloroethene(total)=14,000 µg/kg and Trichloroethene=96,000 µg/kg
- ²² SA10-SCS-41 SVOCs estimated quantities in µg/kg: Pyrene=22; Benzo(b)fluoranthene=22
- ²³ SA3-SCS-42 VOCs estimated quantity in µg/kg: Trichloroethene=4
- ²⁴ SA4-SCS-43 SVOCs estimated quantities in µg/kg: Acenaphthene=23; Carbazole=25; Pyrene=330; Benzo(a)anthracene=140; Chrysene=190; Benzo(b)fluoranthene=240; Benzo(a)pyrene=120; Indeno(1,2,3-cd)pyrene=84; Dibenz(a,h)anthracene=20
- ²⁵ SA4-SCS-44 SVOCs estimated quantities in µg/kg: Pyrene=23; Chrysene=18; Benzo(b)fluoranthene=25

6.0 ANOMALY SUMMARY

The following is a summary of field data specific to each anomaly. The data outlines the specifics associated with the excavation, investigation, remediation and backfill of the 14 designated anomalies in the North 40 between April 22, 1996 and June 4, 1996.

6.1 ANOMALY A-1

6.1.1 Description

Grid Location of Anomaly: N 760
E 1,170

Total Cubic Yards Excavated: 1,445 cubic yards

Number of 55-Gallon Drums Excavated: 7 drums (6 empty & crushed, 1 disposed as Haz-Waste)

Other Materials Excavated: Kegs of unused roofing tar, scrap metal and wood.

Imported Backfill Required: 0 cubic yards

6.1.2 Excavation Summary

Excavation of Anomaly A-1 was started on April 22 and completed on April 25, 1996. Of the seven (7) 55-gallon drums excavated, 6 were crushed and empty. The one remaining 55-gallon drum was placed in a Steel Overpack (A1 D-2) and stored at the Temporary Storage Area (TSA). Haz-Cat results indicated traces of aliphatic and aromatic hydrocarbons (Appendix C). Full analysis for disposal parameters were subsequently performed (Appendix D).

Of the remaining materials excavated the wood debris and roofing tar was disposed of as construction waste, to the BFI Landfill at Pine Bend, Minnesota and the scrap metal (including emptied drums) was sent to the United Defense recycling facility.

Other Materials Excavated: Concrete gun mount, roofing materials, tires and scrap metal

Imported Backfill Required: 0 cubic yards

6.3.2 Excavation Summary

Excavation of Anomaly A-3 was started and completed on May 15, 1996. Of the nine (9) 55-gallon drums excavated, all were intact and contained small amounts of oils, sludges, soil or debris. All of the 55-gallon drums were placed in a steel overpacks (A3 D-16 through D-27) and stored at the TSA. Haz-Cat results indicated contaminants of concern for 7 of the 9 drums (Appendix C). Full analysis for disposal parameters were subsequently performed (Appendix D).

During excavation of Anomaly A-3 the MPCA directed Morrison Knudsen to separate and stockpile approximately 130 cubic yards of suspect soil from the excavation. Subsequent Haz-Cat testing proved the soil free of contaminants.

A concrete and steel gun mount, measuring approximately 10-feet in diameter and 12-feet deep, was uncovered during the excavation but was too massive to be removed. The gun mount was backfilled and compacted in place. (See Drawing 2; Anomaly Excavation Drawing.) The roofing materials were disposed as construction waste, at the BFI Landfill in Pine Bend, Minnesota, and the 19 tires and scrap metal were sent to the United Defense recycling facility.

After Anomaly A-3 was excavated, two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed, in 18 inch-thick lifts and compacted to 95% (minimum) relative density adjacent to the storm drain pipeline, and 85% (minimum) relative density in non-critical areas (Appendix F).

6.3.3 Disposition of 55-Gallon Drums

Drums A3 D-16 through A3 D-24 and Drum A3 D-26 were manifested and transported by Chemical Waste Management, Inc., to Emelle, Alabama, on July 25, 1996, then certified and bulk-shipped to Port Arthur, Texas, for incineration. Note: A3 D-16 was an overpack drum containing a 30-gallon container.

Drums A3 D-25, A3 D-27 and 4 one-gallon containers: PID Screening and Haz-Cat analysis indicated no contaminants of concern. Drums D-25 and D-27 were emptied of soil and sent to scrap metal. Soil was placed in Anomaly A-3 soil stockpile for backfill.

6.4 ANOMALY A-4

6.4.1 Description

Grid Location of Anomaly: N 760
 E 840

Total Cubic Yards Excavated: 408 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Asbestos, industrial debris (paraffin vat), brick, scrap metal and construction debris.

Imported Backfill Required: 0 cubic yards

6.4.2 Excavation Summary

Excavation of Anomaly A-4 was started on May 10 and completed on May 20, 1996. There were various metal plates, scrap metal, sections of metal pipe broken concrete and construction debris found in the excavation. All of the debris was disposed of as construction waste and the scrap metal was sent to the United Defense recycle facility.

At a point approximately half-way through the excavation of anomaly A-4 asbestos, in the form of transite siding, aircell insulation and paraffin sludge, was discovered. EnviroBate Remediation was subcontracted to contain, remove and dispose of the asbestos materials.

A concrete and steel gun mount, measuring approximately 10-feet in diameter and 12-feet deep, was uncovered during the excavation but was too massive to be removed. The gun mount was backfilled and compacted in place. (See Drawing

After Anomaly A-4 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density adjacent to the storm drain pipeline, and 85% (minimum) relative density in non-critical areas (Appendix F).

None

6.5.1 Description

Imported Backfill Required: 0 cubic yards

Excavation of Anomaly A-5 was started on May 2, 1996 and completed on May 6, 1996. Of the three (3) 55-gallon drums and 8 quart cans excavated, all were intact and contained small amounts of solvents, oils, sludges, soil and debris. All of the 55-gallon drums and 8 quart cans were placed in a Steel Overpacks (A5 D-12 through D-24) and stored at the TSA. Haz-Cat results indicated contaminants of concern (Appendix C). Full analysis for disposal parameters were subsequently performed. (Appendix D).

During excavation of Anomaly A-5 the MPCA directed Morrison Knudsen to separate and stockpile approximately 200 cubic yards of suspect soil from the excavation. Subsequent Haz-Cat testing proved the soil free of contaminants. MPCA also directed Morrison Knudsen to extend the excavation of Anomaly A-5 to the east (See Anomaly B-20).

After Anomaly A-5 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.5.3 Disposition of 55-Gallon Drums

Drums A5 D-12 through A5 D-15 were manifested and transported by Chemical Waste Management, Inc., to Emelle, Alabama, on July 25, 1996, then certified and bulk-shipped to Port Arthur, Texas, for incineration.

6.6 ANOMALY A-6

6.6.1 Description

Grid Location of Anomaly: N 930
E 780

Total Cubic Yards Excavated: 734 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: **Scrap Metal**

Imported Backfill Required: 0 cubic yards

6.6.2 Excavation Summary

Excavation of Anomaly A-6 was started and completed on May 6, 1996. There were 3 metal plates (approximately 2'x 2') and miscellaneous metal debris found in the excavation. All metal was sent to the United Defense recycle facility.

After Anomaly A-6 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.6.3 Disposition of 55-Gallon Drums

None

6.7 ANOMALY A-7

6.7.1 Description

Grid Location of Anomaly: N 940
 E 470

Total Cubic Yards Excavated: 263 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

Imported Backfill Required: 0 cubic yards

6.7.2 Excavation Summary

Excavation of Anomaly A-7 was started and completed on May 7, 1996. There were 3 metal plates (approximately 3'x 5') and 2 sections of metal pipe (approximately 3' in length) found in the excavation. All metal was sent to the United Defense recycle facility.

After Anomaly A-7 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.7.3 Disposition of 55-Gallon Drums

None

6.8 ANOMALY A-8

6.8.1 Description

Grid Location of Anomaly: N 880
 E 470

Total Cubic Yards Excavated: 601 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

Imported Backfill Required: 0 cubic yards

6.8.2 Excavation Summary

Excavation of Anomaly A-8 was begun and completed on May 7, 1996. There were 21 metal plates in various shapes and sizes, and wood debris found in the excavation. All metal was sent to the United Defense recycle facility and the wood debris was disposed as construction waste, to the BFI Landfill at Pinebend, MN.

After Anomaly A-8 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.8.3 Disposition of 55-Gallon Drums

None

6.9 ANOMALY A-9

6.9.1 Description

Grid Location of Anomaly: N 640
 E 530

Total Cubic Yards Excavated: 189 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

Imported Backfill Required: 0 cubic yards

6.9.2 Excavation Summary

Excavation of Anomaly A-9 was begun and completed on May 9, 1996. There were 2 metal plates (approximately 2' x 3') found in the excavation. All metal was sent to the United Defense recycle facility.

After Anomaly A-9 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 90% relative density (Appendix F).

6.9.3 Disposition of 55-Gallon Drums

None

6.10 ANOMALY B-5

6.10.1 Description

Grid Location of Anomaly: N 960
 E 280

Total Cubic Yards Excavated: 317 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

Imported Backfill Required: 0 cubic yards

6.10.2 Excavation Summary

Excavation of Anomaly B-5 was begun and completed on May 7, 1996. There were 4 metal plates of various sizes and a 3-foot section of I-beam found in the excavation. All metal was sent to the United Defense recycle facility.

After Anomaly B-5 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.10.3 Disposition of 55-Gallon Drums

None

6.11 ANOMALY B-11

6.11.1 Description

Grid Location of Anomaly: N 770
E 380

Total Cubic Yards Excavated: 142 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

Imported Backfill Required: 0 cubic yards

6.11.2 Excavation Summary

Excavation of Anomaly B-11 was begun and completed on May 8, 1996. There were 2 metal plates (approximately 4' x 6') found in the excavation. All metal was sent to the United Defense recycle facility.

After Anomaly B-11 was excavated two Anomaly Bottom Information Samples were collected for historical record (Appendix E). Backfill was placed in 18 inch-thick lifts and compacted to 95% relative density (Appendix F).

6.11.3 Disposition of 55-Gallon Drums

None

6.12 ANOMALY B-12

6.12.1 Description

Grid Location of Anomaly: N 790
E 430

Total Cubic Yards Excavated: 479 cubic yards

Number of 55-Gallon Drums Excavated: 0

Other Materials Excavated: Scrap Metal

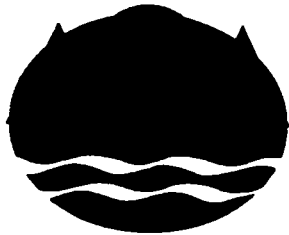
Imported Backfill Required: 0 cubic yards

6.12.2 Excavation Summary

Excavation of Anomaly B-12 was started and completed on May 8, 1996. There were 2 metal plates (approximately 3' x 5'), and a solid reinforced concrete tower foundation, discovered during excavation. All metal was sent to the United Defense recycle facility. As the tower foundation was too massive to remove, it was backfilled and compacted in place. (See Drawing 2; Anomaly Excavation Drawing.)

APPENDIX I

REVISED SESOIL MODELING FOR OU2



Minnesota Pollution Control Agency

December 27, 1996

**CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

Commanding Officer
Southern Division
Naval Facilities Engineering Command
Attn.: Scott A. Glass, Code 18610
P.O. Box 190010
North Charleston, South Carolina 29419-9010

RE: Naval Industrial Reserve Ordnance Plant Superfund Site

Dear Mr. Glass:

The Minnesota Pollution Control Agency (MPCA) staff has established new soil cleanup numbers for Operable Unit 2 (OU2) for the Naval Industrial Reserve Ordnance Plant (NIROP) Superfund site pursuant to the Federal Facility Agreement, dated March 27, 1991, between the MPCA, the U.S. Environmental Protection Agency (EPA), and the U.S. Navy (Navy).

The soil cleanup numbers are found in Table 7 of Attachment I to this letter and were developed using the SESOIL modeling software.

As you are aware in the MPCA staff letter of July 26, 1996, the staff requested that the Navy delete sections of the OU3 Remedial Investigation/Feasibility Study Work Plan pertaining to the discussion of the MPCA staff soil cleanup model. This request was based upon the staff's belief that the former MPCA Soil Cleanup Model was outdated. The MPCA staff believes that the SESOIL modeling software has generated soil cleanup numbers that better reflect conditions at the NIROP site. However, the cleanup numbers reflect actual site data for OU2 provided by RMT, Inc. on behalf of the Navy. This OU2 data is of sufficient quality for development of valid cleanup numbers.

Scott A. Glass

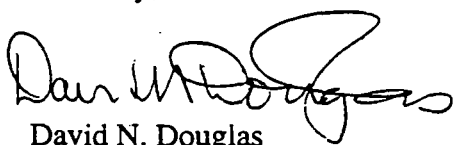
Page 2

December 27, 1996

The MPCA staff recommends delaying development of OU3 vadose zone soil cleanup numbers based on leaching of contaminants to ground water until OU3 site soil data is available.

If you have any questions regarding this letter, please me at (612) 296-7818.

Sincerely,

A handwritten signature in black ink, appearing to read "Dan N. Douglas", written in a cursive style.

David N. Douglas
Project Manager
Response Unit I
Site Response Section
Ground Water and Solid Waste Division

DND:lk

Enclosure

cc: Joel Murphy, Navy (w/ enclosure)
Thomas Bloom, EPA (w/ enclosure)
Mark Perry, Brown & Root Environmental (w/ enclosure)

Attachment I

Soil Cleanup Numbers for Operable Unit 2 of the Naval Industrial Reserve Ordnance Plant

Leaching Potential of Compounds from Naval Industrial Ordnance Plant Operable Unit 2 Soils

Introduction

This is a brief overview of the approach used to develop cleanup numbers for trichloroethylene (TCE), 1, 1, 1-trichloroethane (TCA), tetrachloroethylene (PCE) and dichloroethylene (DCE) in the Operable Unit 2 (OU2) soils at Naval Industrial Reserve Ordnance Plant (NIROP). Soil type, chemical concentrations by depth, soil organic carbon concentrations by depth, and dilution values are briefly discussed and referenced. This is not intended as a detailed discussion of soil modeling, the SESOIL model, or the derivations for model default values which are beyond the scope of this summary.

The MPCA staff recognizes that no model can yield numbers that are infallible in predicting the soil concentration of a compound that, once exceeded, will impact soil by leaching from the soil. However, because remedial decisions for a site rest largely on the risk contaminants in the soil pose to underlying ground water, it is imperative to adopt some modeling approach to develop realistic contaminant-specific cleanup numbers for the soil. We have adopted the SESOIL model as a reasonable and necessary approach to the development of these numbers. In addition, a reasonable dilution term for the leachate is incorporated that is representative of aquifer conditions while protecting ground water as a resource.

The SESOIL model is based on an adsorption-desorption understanding of contaminant transport in the subsurface soil ($Cl = Cs \cdot Kd$, where Cl is the leachate concentration, Cs is the chemical concentration in soil, and Kd is the chemical specific adsorption constant), and accommodates data representative of four layers, with the option of further dividing each layer into ten sublayers. The model considers chemical concentration, organic matter (each by sublayer), soil type, hydrologic data (site specific) partitioning coefficients, Henry's constant, biodegradation rates, volatility, and other chemical data to predict leachate concentrations exiting from each sublayer. Our primary concern is with the leachate emanating from the lowest sublayer that enters the groundwater. Hydrologic data and details concerning the calibration of the model with regional climatic data, though available for review, is beyond the scope of this summary. Information on details concerning the SESOIL model can be found elsewhere (1).

The dilution term, or dilution attenuation factor (DAF), is based upon site specific aquifer hydraulic conductivity, ground water gradient, depth of mixing in the ground water, the length of the contaminated source area, and the rate of hydraulic infiltration to the aquifer. Each of these values is discussed in the section below. The DAF term is used in conjunction with the leachate concentration predicted by SESOIL to derive a soil cleanup number for the site.

Discussion of Chemical and Site Specific Values used in the SESOIL Leaching Model

Soil data for the model was taken from the Remedial Investigation (RI) for the OU2 soils unit for NIROP (2). Soil samples were collected at roughly two foot intervals to ground water, resulting in depth profiles for TCE, TCA, PCE, and DCE, as well as for organic carbon. In addition, detailed soil boring logs are available that provide soil characteristics necessary for modeling. The hydraulic conductivity, hydraulic gradient, and source area length data were also obtained from the RI report. Other compound specific data, such as molecular weight, Henry's constant, and partitioning constants are found in supporting literature (3).

No biodegradation is assumed in these modeling efforts. Although certain rates can be assumed for simple aromatic compounds (most notably BTEX), chlorinated aliphatic compounds are more recalcitrant. Therefore, biodegradation is assumed to be zero unless site-specific microcosm data indicates otherwise.

Table 1 shows the maximum concentrations of TCE, TCA, PCE, and DCE (COCs) found by depth in the OU2 soils. It is important to note that these concentrations are not representative of one soil boring at the site, but are a compilation of the highest concentrations found by depth interval from the data. Though the results are not based on modeling the maximum values, it is useful to compare the results of the modeling with these numbers to gain perspective on how site conditions compare to the model derived cleanup numbers.

Table 2 shows the average concentrations of the COCs by depth in the OU2 soils, and is the data used in the modeling effort. As in Table 1, these are not representative of a single boring at the site. Figure 1 graphically represents the average concentration of the COCs as a function of depth for the OU2 soils.

As outlined above, SESOIL uses site-specific soil data in layers. Table 3 includes the data for the COC and total organic carbon (TOC) concentrations that were used in each of the four broad layers. These layers were defined by grouping similar TOC concentrations: layer 1, with the highest TOC value of 9918 parts per million (ppm) from one-three feet; layer 2, with the roughly similar 6143 and 4658 ppm values from three-eight feet; layer 3, with TOC concentrations of 3086 and 2209 ppm from eight-twelve feet; and the remaining fourth layer defined from 13-20 feet. Table 3 also lists the corresponding COC data by

depth (taken from Table 2). Each of these layers was further divided into ten sublayers as detailed in Table 4. (This data also appears in the data output file in Attachment 1, but is repeated in Table 4 for clarity.) Attachment 1 gives greater detail on particular data, including soil density, soil porosity values, COC solubility, diffusion coefficients, molecular weight, Henry's constants, and Koc values.

Soil boring logs indicate that the soil in OU2 is a coarse to silty poorly graded sand. The logs indicate the presence of clay in certain borings, but is intermittent in occurrence. The model was therefore run with data corresponding to a sandy soil.

The model runs simulated leaching over 25 years with a resolution of one month intervals. The leachate concentrations at the lowest soil sublayer as a function of time appear in Table 5, and plotted graphically against time in Figures 2 and 3. These data are plotted against time in Figure 2. Figure 3 plots PCE leachate alone against time on a different ordinate scale to give greater resolution to this COC leachate. The highest leachate concentration (C_{si} , shown at the top of Table 5) predicted over the 25 year simulation is carried forward in the development of the soil cleanup number.

Because the concentration of the leachate at the lowest soil layer is not indicative of the ground water concentration of that COC, a dilution term for the leachate has been factored into the leachate concentration. From the RI report, hydraulic conductivity for the shallow ground water was estimated at 6.62256×10^5 cm/year, and the hydraulic gradient estimated at 5×10^{-4} ft/ft. There is no data on the thickness of the shallow ground water unit at OU2. Recent seismic imaging data suggest that the ground water at 20 feet is in contact with the Prairie du Chien ground water. However, we have adopted a zone of mixing for the ground water at 12.5 feet, which is the default that is used in the calculation of the DAF term here. The infiltration rate to the ground water from the soil is 16.7 cm/year, based on climatological data and hydrological calibration of the model. The allowable zone of mixing is confined to the vertical boundaries of the source area (source area A), estimated at 2.4384×10^4 cm. The calculation of the DAF term is therefore estimated at 1.3 (Table 6).

To obtain an estimate of COC soil concentrations that will not result in the degradation of ground water above the Health Risk Limit (HRL), the ratio of the C_{si} to a representative present concentration of COC in the soil column (C_{sf}) is found, then multiplied by the HRL:

$$(C_{si}/C_{sf}) * HRL = \text{estimated soil cleanup number}$$

C_{sf} was estimated by vertically averaging the values in Table 2 for each COC. Table 7 lists each of these values per COC, with the corresponding soil cleanup number appearing at the bottom of the table.

Table 1. Maximum concentrations of trichloroethylene, tetrachloroethylene, dichloroethylene, and trichloroethane found in OU2 soil by depth.*

Soil Depth (ft)	TCE (ppb)	PCE (ppb)	TCA (ppb)	DCE (ppb)
3	37	3	2	3
5	110	9	9	32
8	6300	500	14000	62000
10	54000	130	0	0
12	15	3	0	8
15	45	2	0	0
18	28	110	0	9
20	220	9	0	69
22	230	39	0	130
24	57	25	1	19

* Data from: *Remedial Investigation Report for the Soils Operable Unit at the Naval Industrial Ordnance Plant*, September, 1993. Appendix E.

Table 2. Average concentrations of trichloroethylene, tetrachloroethylene, dichloroethylene, and trichloroethane in OU2 soil by depth.*

Soil Depth (ft)	TCE (ppb)	PCE (ppb)	TCA (ppb)	DCE (ppb)
3	21	3	2	3
5	55	7	8	32
8	4539	62	3508	12828
10	6858	36	0	0
12	5	2	0	8
15	13	2	0	0
18	7	39	0	6
20	1.5	6	0	69
22	39	10	0	35
24	24	9	0	10

* Derived from data in: *Remedial Investigation Report for the Soils Operable Unit at the Naval Industrial Ordnance Plant*, September, 1993. Appendix E.

Table 3. Model input values according to depth and model layer for total organic carbon (TOC) and concentrations of TCE, PCE, TCA, and DCE.

Model Layer*	Depth			TOC (ppm)			TCE (ppb)	PCE (ppb)	TCA (ppb)	DCE (ppb)
	(ft)	(cm)	Layer thickness (cm)	Soil Conc.	Ave.	Fraction	TCE (ppb)	PCE (ppb)	TCA (ppb)	DCE (ppb)
1	1-3	0-91	91	9918	9918	1.00	21	3	2	3
2	3-5	91-152	154	6143	5400	0.54	55	7	8	32
	5-8	152-244		4658			4513	62	3508	12828
3	8-10	244-305	122	3086	2674	0.26	6858	36	0	0
	10-12	305-366		2209			5	2	0	8
4	13-15	366-457	244	1377	2293	0.23	13	2	0	0
	16-18	366-548		3842			7	39	0	6
	18-20**	548-610		1660			1.5	6	0	69

* Each of the four layers are further subdivided into ten sublayers for modelling purposes. See SESOIL model input sheets for specific values entered per sublayer.

** Water table assumed at 20 ft.

Table 4.

Layer	Sublayer	COC (in ppb)				Fraction TOC*
		TCE	PCE	TCA	DCE	
1	1	21	3	2	3	1.0
	2	21	3	2	3	
	3	21	3	2	3	
	4	21	3	2	3	
	5	21	3	2	3	
	6	21	3	2	3	
	7	21	3	2	3	
	8	21	3	2	3	
	9	21	3	2	3	
	10	21	3	2	3	
2	1	55	7	8	32	0.54
	2	55	7	8	32	
	3	55	7	8	32	
	4	55	7	8	32	
	5	55	7	8	32	
	6	4513	62	3508	12828	
	7	4513	62	3508	12828	
	8	4513	62	3508	12828	
	9	4513	62	3508	12828	
	10	4513	62	3508	12828	
3	1	6858	36	0	0	0.26
	2	6858	36	0	0	
	3	6858	36	0	0	
	4	6858	36	0	0	
	5	6858	36	0	0	
	6	5	2	0	8	
	7	5	2	0	8	
	8	5	2	0	8	
	9	5	2	0	8	
	10	5	2	0	8	
4	1	13	2	0	0	0.23
	2	13	2	0	0	
	3	13	2	0	0	
	4	7	39	0	6	
	5	7	39	0	6	
	6	7	39	0	6	
	7	1.5	6	0	69	
	8	1.5	6	0	69	
	9	1.5	6	0	69	
	10	1.5	6	0	69	

* Sesoil utilizes TOC data as a fraction of the maximum value found in the soil. Thus, layer 1 has a value of 1.0, layer 2 a value of 9918/5400, or 0.54, and so on.

Table 5. SESOIL model results: leachate entering ground water versus time.

			Compound	TCE	PCE	DCE	TCA
			Max. Conc.	1.39E-02	7.68E-03	1.49E-01	0.00E+00
YEAR	MONTH	Total Months	Leachate (ppm)				
1	1	1	3.78E-03	6.53E-03	1.11E-01	0.00E+00	
1	2	2	3.94E-03	6.68E-03	9.00E-02	0.00E+00	
1	3	3	4.02E-03	6.67E-03	8.09E-02	0.00E+00	
1	4	4	4.09E-03	6.71E-03	7.83E-02	0.00E+00	
1	5	5	4.14E-03	6.73E-03	7.85E-02	0.00E+00	
1	6	6	4.41E-03	7.27E-03	7.43E-02	0.00E+00	
1	7	7	4.53E-03	7.45E-03	7.86E-02	0.00E+00	
1	8	8	4.62E-03	7.68E-03	8.08E-02	0.00E+00	
1	9	9	4.73E-03	7.53E-03	8.27E-02	0.00E+00	
1	10	10	4.85E-03	6.98E-03	8.50E-02	0.00E+00	
1	11	11	4.98E-03	6.39E-03	8.67E-02	0.00E+00	
1	12	12	5.08E-03	5.74E-03	8.84E-02	0.00E+00	
2	1	13	5.15E-03	5.15E-03	8.87E-02	0.00E+00	
2	2	14	5.20E-03	4.68E-03	8.66E-02	0.00E+00	
2	3	15	5.26E-03	4.15E-03	8.78E-02	0.00E+00	
2	4	16	5.31E-03	3.69E-03	8.88E-02	0.00E+00	
2	5	17	5.36E-03	3.24E-03	9.02E-02	0.00E+00	
2	6	18	5.63E-03	3.09E-03	8.55E-02	0.00E+00	
2	7	19	5.94E-03	2.80E-03	9.05E-02	0.00E+00	
2	8	20	6.24E-03	2.55E-03	9.31E-02	0.00E+00	
2	9	21	6.61E-03	2.33E-03	9.55E-02	0.00E+00	
2	10	22	7.01E-03	2.12E-03	9.84E-02	0.00E+00	
2	11	23	7.41E-03	1.93E-03	1.01E-01	0.00E+00	
2	12	24	7.69E-03	1.72E-03	1.04E-01	0.00E+00	
3	1	25	7.91E-03	1.54E-03	1.05E-01	0.00E+00	
3	2	26	8.15E-03	1.40E-03	1.04E-01	0.00E+00	
3	3	27	8.28E-03	1.24E-03	1.06E-01	0.00E+00	
3	4	28	8.40E-03	1.10E-03	1.07E-01	0.00E+00	
3	5	29	8.49E-03	9.67E-04	1.09E-01	0.00E+00	
3	6	30	9.17E-03	9.23E-04	1.09E-01	0.00E+00	
3	7	31	9.75E-03	8.35E-04	1.19E-01	0.00E+00	
3	8	32	1.03E-02	7.61E-04	1.26E-01	0.00E+00	
3	9	33	1.11E-02	6.97E-04	1.35E-01	0.00E+00	
3	10	34	1.18E-02	6.34E-04	1.43E-01	0.00E+00	
3	11	35	1.25E-02	5.75E-04	1.49E-01	0.00E+00	
3	12	36	1.30E-02	5.15E-04	1.48E-01	0.00E+00	
4	1	37	1.34E-02	4.60E-04	1.39E-01	0.00E+00	
4	2	38	1.37E-02	4.18E-04	1.28E-01	0.00E+00	
4	3	39	1.38E-02	3.70E-04	1.20E-01	0.00E+00	
4	4	40	1.39E-02	3.29E-04	1.13E-01	0.00E+00	
4	5	41	1.29E-02	2.89E-04	1.05E-01	0.00E+00	
4	6	42	1.21E-02	2.76E-04	9.50E-02	0.00E+00	

4	7	43	1.15E-02	2.49E-04	9.37E-02	0.00E+00
4	8	44	1.07E-02	2.27E-04	8.96E-02	0.00E+00
4	9	45	1.00E-02	2.08E-04	8.53E-02	0.00E+00
4	10	46	9.34E-03	1.89E-04	8.12E-02	0.00E+00
4	11	47	8.67E-03	1.72E-04	7.67E-02	0.00E+00
4	12	48	7.97E-03	1.54E-04	7.21E-02	0.00E+00
5	1	49	7.27E-03	1.37E-04	6.67E-02	0.00E+00
5	2	50	6.67E-03	1.25E-04	6.11E-02	0.00E+00
5	3	51	6.08E-03	1.10E-04	5.73E-02	0.00E+00
5	4	52	5.55E-03	9.81E-05	5.34E-02	0.00E+00
5	5	53	5.03E-03	8.62E-05	4.97E-02	0.00E+00
5	6	54	4.70E-03	8.23E-05	4.50E-02	0.00E+00
5	7	55	4.43E-03	7.44E-05	4.44E-02	0.00E+00
5	8	56	4.14E-03	6.78E-05	4.24E-02	0.00E+00
5	9	57	3.86E-03	6.20E-05	4.04E-02	0.00E+00
5	10	58	3.60E-03	5.65E-05	3.84E-02	0.00E+00
5	11	59	3.34E-03	5.12E-05	3.63E-02	0.00E+00
5	12	60	3.07E-03	4.58E-05	3.41E-02	0.00E+00
6	1	61	2.80E-03	4.10E-05	3.15E-02	0.00E+00
6	2	62	2.56E-03	3.72E-05	2.89E-02	0.00E+00
6	3	63	2.34E-03	3.29E-05	2.71E-02	0.00E+00
6	4	64	2.14E-03	2.93E-05	2.53E-02	0.00E+00
6	5	65	1.93E-03	2.57E-05	2.35E-02	0.00E+00
6	6	66	1.81E-03	2.45E-05	2.13E-02	0.00E+00
6	7	67	1.70E-03	2.22E-05	2.10E-02	0.00E+00
6	8	68	1.59E-03	2.02E-05	2.00E-02	0.00E+00
6	9	69	1.49E-03	1.85E-05	1.91E-02	0.00E+00
6	10	70	1.38E-03	1.68E-05	1.81E-02	0.00E+00
6	11	71	1.28E-03	1.53E-05	1.71E-02	0.00E+00
6	12	72	1.18E-03	1.37E-05	1.61E-02	0.00E+00
7	1	73	1.08E-03	1.22E-05	1.49E-02	0.00E+00
7	2	74	9.86E-04	1.11E-05	1.36E-02	0.00E+00
7	3	75	9.00E-04	9.79E-06	1.28E-02	0.00E+00
7	4	76	8.21E-04	8.70E-06	1.19E-02	0.00E+00
7	5	77	7.43E-04	7.64E-06	1.11E-02	0.00E+00
7	6	78	6.95E-04	7.29E-06	1.01E-02	0.00E+00
7	7	79	6.55E-04	6.59E-06	9.91E-03	0.00E+00
7	8	80	6.12E-04	6.00E-06	9.46E-03	0.00E+00
7	9	81	5.71E-04	5.49E-06	9.01E-03	0.00E+00
7	10	82	5.32E-04	4.99E-06	8.57E-03	0.00E+00
7	11	83	4.93E-04	4.52E-06	8.09E-03	0.00E+00
7	12	84	4.53E-04	4.04E-06	7.60E-03	0.00E+00
8	1	85	4.14E-04	3.61E-06	7.04E-03	0.00E+00
8	2	86	3.79E-04	3.28E-06	6.44E-03	0.00E+00
8	3	87	3.46E-04	2.89E-06	6.05E-03	0.00E+00
8	4	88	3.16E-04	2.57E-06	5.64E-03	0.00E+00
8	5	89	2.86E-04	2.25E-06	5.24E-03	0.00E+00
8	6	90	2.67E-04	2.15E-06	4.75E-03	0.00E+00
8	7	91	2.52E-04	1.94E-06	4.68E-03	0.00E+00

8	8	92	2.35E-04	1.76E-06	4.47E-03	0.00E+00
8	9	93	2.20E-04	1.61E-06	4.26E-03	0.00E+00
8	10	94	2.05E-04	1.46E-06	4.05E-03	0.00E+00
8	11	95	1.90E-04	1.32E-06	3.82E-03	0.00E+00
8	12	96	1.74E-04	1.18E-06	3.59E-03	0.00E+00
9	1	97	1.59E-04	1.05E-06	3.33E-03	0.00E+00
9	2	98	1.46E-04	9.51E-07	3.05E-03	0.00E+00
9	3	99	1.33E-04	8.36E-07	2.86E-03	0.00E+00
9	4	100	1.21E-04	7.39E-07	2.66E-03	0.00E+00
9	5	101	1.10E-04	6.45E-07	2.48E-03	0.00E+00
9	6	102	1.03E-04	6.11E-07	2.25E-03	0.00E+00
9	7	103	9.68E-05	5.49E-07	2.21E-03	0.00E+00
9	8	104	9.04E-05	4.95E-07	2.11E-03	0.00E+00
9	9	105	8.44E-05	4.49E-07	2.01E-03	0.00E+00
9	10	106	7.86E-05	4.04E-07	1.91E-03	0.00E+00
9	11	107	7.29E-05	3.62E-07	1.81E-03	0.00E+00
9	12	108	6.69E-05	3.20E-07	1.70E-03	0.00E+00
10	1	109	6.11E-05	2.83E-07	1.57E-03	0.00E+00
10	2	110	5.60E-05	2.51E-07	1.44E-03	0.00E+00
10	3	111	5.11E-05	2.18E-07	1.35E-03	0.00E+00
10	4	112	4.66E-05	1.90E-07	1.26E-03	0.00E+00
10	5	113	4.22E-05	1.62E-07	1.17E-03	0.00E+00
10	6	114	3.94E-05	1.51E-07	1.06E-03	0.00E+00
10	7	115	3.72E-05	1.32E-07	1.05E-03	0.00E+00
10	8	116	3.47E-05	1.16E-07	9.99E-04	0.00E+00
10	9	117	3.24E-05	1.01E-07	9.51E-04	0.00E+00
10	10	118	3.02E-05	8.66E-08	9.04E-04	0.00E+00
10	11	119	2.80E-05	7.30E-08	8.54E-04	0.00E+00
10	12	120	2.57E-05	6.10E-08	8.02E-04	0.00E+00
11	1	121	2.34E-05	5.02E-08	7.43E-04	0.00E+00
11	2	122	2.15E-05	4.11E-08	6.80E-04	0.00E+00
11	3	123	1.96E-05	3.24E-08	6.38E-04	0.00E+00
11	4	124	1.79E-05	2.55E-08	5.95E-04	0.00E+00
11	5	125	1.62E-05	1.94E-08	5.53E-04	0.00E+00
11	6	126	1.51E-05	1.53E-08	5.01E-04	0.00E+00
11	7	127	1.42E-05	9.80E-09	4.94E-04	0.00E+00
11	8	128	1.33E-05	4.80E-09	4.72E-04	0.00E+00
11	9	129	1.24E-05	2.00E-10	4.49E-04	0.00E+00
11	10	130	1.15E-05	1.00E-10	4.27E-04	0.00E+00
11	11	131	1.07E-05	1.00E-10	4.04E-04	0.00E+00
11	12	132	9.81E-06	1.00E-10	3.79E-04	0.00E+00
12	1	133	8.95E-06	1.00E-10	3.51E-04	0.00E+00
12	2	134	8.20E-06	1.00E-10	3.21E-04	0.00E+00
12	3	135	7.47E-06	1.00E-10	3.01E-04	0.00E+00
12	4	136	6.81E-06	1.00E-10	2.81E-04	0.00E+00
12	5	137	6.16E-06	1.00E-10	2.61E-04	0.00E+00
12	6	138	5.75E-06	1.00E-10	2.37E-04	0.00E+00
12	7	139	5.42E-06	1.00E-10	2.33E-04	0.00E+00
12	8	140	5.05E-06	1.00E-10	2.23E-04	0.00E+00

12	9	141	4.71E-06	1.00E-10	2.12E-04	0.00E+00
12	10	142	4.38E-06	1.00E-10	2.02E-04	0.00E+00
12	11	143	4.05E-06	1.00E-10	1.91E-04	0.00E+00
12	12	144	3.71E-06	1.00E-10	1.79E-04	0.00E+00
13	1	145	3.39E-06	1.00E-10	1.66E-04	0.00E+00
13	2	146	3.10E-06	1.00E-10	1.52E-04	0.00E+00
13	3	147	2.82E-06	1.00E-10	1.42E-04	0.00E+00
13	4	148	2.57E-06	1.00E-10	1.33E-04	0.00E+00
13	5	149	2.32E-06	1.00E-10	1.24E-04	0.00E+00
13	6	150	2.16E-06	1.00E-10	1.12E-04	0.00E+00
13	7	151	2.03E-06	1.00E-10	1.10E-04	0.00E+00
13	8	152	1.89E-06	1.00E-10	1.05E-04	0.00E+00
13	9	153	1.75E-06	1.00E-10	1.00E-04	0.00E+00
13	10	154	1.63E-06	1.00E-10	9.54E-05	0.00E+00
13	11	155	1.51E-06	1.00E-10	9.01E-05	0.00E+00
13	12	156	1.38E-06	1.00E-10	8.46E-05	0.00E+00
14	1	157	1.25E-06	1.00E-10	7.84E-05	0.00E+00
14	2	158	1.14E-06	1.00E-10	7.17E-05	0.00E+00
14	3	159	1.03E-06	1.00E-10	6.73E-05	0.00E+00
14	4	160	9.35E-07	1.00E-10	6.27E-05	0.00E+00
14	5	161	8.39E-07	1.00E-10	5.83E-05	0.00E+00
14	6	162	7.77E-07	1.00E-10	5.28E-05	0.00E+00
14	7	163	7.32E-07	1.00E-10	5.21E-05	0.00E+00
14	8	164	6.76E-07	1.00E-10	4.97E-05	0.00E+00
14	9	165	6.20E-07	1.00E-10	4.74E-05	0.00E+00
14	10	166	5.70E-07	1.00E-10	4.51E-05	0.00E+00
14	11	167	5.23E-07	1.00E-10	4.25E-05	0.00E+00
14	12	168	4.76E-07	1.00E-10	4.00E-05	0.00E+00
15	1	169	4.27E-07	1.00E-10	3.70E-05	0.00E+00
15	2	170	3.90E-07	1.00E-10	3.39E-05	0.00E+00
15	3	171	3.49E-07	1.00E-10	3.18E-05	0.00E+00
15	4	172	3.09E-07	1.00E-10	2.96E-05	0.00E+00
15	5	173	2.71E-07	1.00E-10	2.75E-05	0.00E+00
15	6	174	2.50E-07	1.00E-10	2.50E-05	0.00E+00
15	7	175	2.25E-07	1.00E-10	2.46E-05	0.00E+00
15	8	176	1.99E-07	1.00E-10	2.35E-05	0.00E+00
15	9	177	1.77E-07	1.00E-10	2.24E-05	0.00E+00
15	10	178	1.56E-07	1.00E-10	2.13E-05	0.00E+00
15	11	179	1.36E-07	1.00E-10	2.01E-05	0.00E+00
15	12	180	1.16E-07	1.00E-10	1.89E-05	0.00E+00
16	1	181	9.93E-08	1.00E-10	1.75E-05	0.00E+00
16	2	182	8.50E-08	1.00E-10	1.60E-05	0.00E+00
16	3	183	7.00E-08	1.00E-10	1.50E-05	0.00E+00
16	4	184	5.50E-08	1.00E-10	1.40E-05	0.00E+00
16	5	185	4.10E-08	1.00E-10	1.30E-05	0.00E+00
16	6	186	3.50E-08	1.00E-10	1.18E-05	0.00E+00
16	7	187	2.55E-08	1.00E-10	1.16E-05	0.00E+00
16	8	188	1.70E-08	1.00E-10	1.11E-05	0.00E+00
16	9	189	9.50E-09	1.00E-10	1.05E-05	0.00E+00

16	10	190	2.00E-09	1.00E-10	1.00E-05	0.00E+00
16	11	191	1.00E-10	1.00E-10	9.47E-06	0.00E+00
16	12	192	1.00E-10	1.00E-10	8.90E-06	0.00E+00
17	1	193	1.00E-10	1.00E-10	8.24E-06	0.00E+00
17	2	194	1.00E-10	1.00E-10	7.54E-06	0.00E+00
17	3	195	1.00E-10	1.00E-10	7.07E-06	0.00E+00
17	4	196	1.00E-10	1.00E-10	6.59E-06	0.00E+00
17	5	197	1.00E-10	1.00E-10	6.12E-06	0.00E+00
17	6	198	1.00E-10	1.00E-10	5.55E-06	0.00E+00
17	7	199	1.00E-10	1.00E-10	5.47E-06	0.00E+00
17	8	200	1.00E-10	1.00E-10	5.22E-06	0.00E+00
17	9	201	1.00E-10	1.00E-10	4.97E-06	0.00E+00
17	10	202	1.00E-10	1.00E-10	4.73E-06	0.00E+00
17	11	203	1.00E-10	1.00E-10	4.46E-06	0.00E+00
17	12	204	1.00E-10	1.00E-10	4.19E-06	0.00E+00
18	1	205	1.00E-10	1.00E-10	3.89E-06	0.00E+00
18	2	206	1.00E-10	1.00E-10	3.56E-06	0.00E+00
18	3	207	1.00E-10	1.00E-10	3.33E-06	0.00E+00
18	4	208	1.00E-10	1.00E-10	3.11E-06	0.00E+00
18	5	209	1.00E-10	1.00E-10	2.90E-06	0.00E+00
18	6	210	1.00E-10	1.00E-10	2.62E-06	0.00E+00
18	7	211	1.00E-10	1.00E-10	2.59E-06	0.00E+00
18	8	212	1.00E-10	1.00E-10	2.46E-06	0.00E+00
18	9	213	1.00E-10	1.00E-10	2.34E-06	0.00E+00
18	10	214	1.00E-10	1.00E-10	2.24E-06	0.00E+00
18	11	215	1.00E-10	1.00E-10	2.11E-06	0.00E+00
18	12	216	1.00E-10	1.00E-10	1.97E-06	0.00E+00
19	1	217	1.00E-10	1.00E-10	1.84E-06	0.00E+00
19	2	218	1.00E-10	1.00E-10	1.67E-06	0.00E+00
19	3	219	1.00E-10	1.00E-10	1.58E-06	0.00E+00
19	4	220	1.00E-10	1.00E-10	1.47E-06	0.00E+00
19	5	221	1.00E-10	1.00E-10	1.37E-06	0.00E+00
19	6	222	1.00E-10	1.00E-10	1.22E-06	0.00E+00
19	7	223	1.00E-10	1.00E-10	1.22E-06	0.00E+00
19	8	224	1.00E-10	1.00E-10	1.17E-06	0.00E+00
19	9	225	1.00E-10	1.00E-10	1.11E-06	0.00E+00
19	10	226	1.00E-10	1.00E-10	1.05E-06	0.00E+00
19	11	227	1.00E-10	1.00E-10	9.89E-07	0.00E+00
19	12	228	1.00E-10	1.00E-10	9.32E-07	0.00E+00
20	1	229	1.00E-10	1.00E-10	8.63E-07	0.00E+00
20	2	230	1.00E-10	1.00E-10	7.99E-07	0.00E+00
20	3	231	1.00E-10	1.00E-10	7.51E-07	0.00E+00
20	4	232	1.00E-10	1.00E-10	6.95E-07	0.00E+00
20	5	233	1.00E-10	1.00E-10	6.44E-07	0.00E+00
20	6	234	1.00E-10	1.00E-10	5.72E-07	0.00E+00
20	7	235	1.00E-10	1.00E-10	5.69E-07	0.00E+00
20	8	236	1.00E-10	1.00E-10	5.43E-07	0.00E+00
20	9	237	1.00E-10	1.00E-10	5.13E-07	0.00E+00
20	10	238	1.00E-10	1.00E-10	4.86E-07	0.00E+00

20	11	239	1.00E-10	1.00E-10	4.55E-07	0.00E+00
20	12	240	1.00E-10	1.00E-10	4.27E-07	0.00E+00
21	1	241	1.00E-10	1.00E-10	3.92E-07	0.00E+00
21	2	242	1.00E-10	1.00E-10	3.51E-07	0.00E+00
21	3	243	1.00E-10	1.00E-10	3.24E-07	0.00E+00
21	4	244	1.00E-10	1.00E-10	2.97E-07	0.00E+00
21	5	245	1.00E-10	1.00E-10	2.71E-07	0.00E+00
21	6	246	1.00E-10	1.00E-10	2.50E-07	0.00E+00
21	7	247	1.00E-10	1.00E-10	2.31E-07	0.00E+00
21	8	248	1.00E-10	1.00E-10	2.20E-07	0.00E+00
21	9	249	1.00E-10	1.00E-10	2.15E-07	0.00E+00
21	10	250	1.00E-10	1.00E-10	2.15E-07	0.00E+00
21	11	251	1.00E-10	1.00E-10	2.14E-07	0.00E+00
21	12	252	1.00E-10	1.00E-10	2.05E-07	0.00E+00
22	1	253	1.00E-10	1.00E-10	2.03E-07	0.00E+00
22	2	254	1.00E-10	1.00E-10	1.97E-07	0.00E+00
22	3	255	1.00E-10	1.00E-10	1.99E-07	0.00E+00
22	4	256	1.00E-10	1.00E-10	2.00E-07	0.00E+00
22	5	257	1.00E-10	1.00E-10	2.01E-07	0.00E+00
22	6	258	1.00E-10	1.00E-10	1.87E-07	0.00E+00
22	7	259	1.00E-10	1.00E-10	1.95E-07	0.00E+00
22	8	260	1.00E-10	1.00E-10	1.96E-07	0.00E+00
22	9	261	1.00E-10	1.00E-10	1.96E-07	0.00E+00
22	10	262	1.00E-10	1.00E-10	1.96E-07	0.00E+00
22	11	263	1.00E-10	1.00E-10	1.95E-07	0.00E+00
22	12	264	1.00E-10	1.00E-10	1.95E-07	0.00E+00
23	1	265	1.00E-10	1.00E-10	1.93E-07	0.00E+00
23	2	266	1.00E-10	1.00E-10	1.88E-07	0.00E+00
23	3	267	1.00E-10	1.00E-10	1.90E-07	0.00E+00
23	4	268	1.00E-10	1.00E-10	1.91E-07	0.00E+00
23	5	269	1.00E-10	1.00E-10	1.92E-07	0.00E+00
23	6	270	1.00E-10	1.00E-10	1.79E-07	0.00E+00
23	7	271	1.00E-10	1.00E-10	1.86E-07	0.00E+00
23	8	272	1.00E-10	1.00E-10	1.87E-07	0.00E+00
23	9	273	1.00E-10	1.00E-10	1.87E-07	0.00E+00
23	10	274	1.00E-10	1.00E-10	1.87E-07	0.00E+00
23	11	275	1.00E-10	1.00E-10	1.86E-07	0.00E+00
23	12	276	1.00E-10	1.00E-10	1.86E-07	0.00E+00
24	1	277	1.00E-10	1.00E-10	1.84E-07	0.00E+00
24	2	278	1.00E-10	1.00E-10	1.79E-07	0.00E+00
24	3	279	1.00E-10	1.00E-10	1.80E-07	0.00E+00
24	4	280	1.00E-10	1.00E-10	1.81E-07	0.00E+00
24	5	281	1.00E-10	1.00E-10	1.82E-07	0.00E+00
24	6	282	1.00E-10	1.00E-10	1.70E-07	0.00E+00
24	7	283	1.00E-10	1.00E-10	1.77E-07	0.00E+00
24	8	284	1.00E-10	1.00E-10	1.78E-07	0.00E+00
24	9	285	1.00E-10	1.00E-10	1.78E-07	0.00E+00
24	10	286	1.00E-10	1.00E-10	1.79E-07	0.00E+00
24	11	287	1.00E-10	1.00E-10	1.78E-07	0.00E+00

24	12	288	1.00E-10	1.00E-10	1.78E-07	0.00E+00
25	1	289	1.00E-10	1.00E-10	1.76E-07	0.00E+00
25	2	290	1.00E-10	1.00E-10	1.71E-07	0.00E+00
25	3	291	1.00E-10	1.00E-10	1.72E-07	0.00E+00
25	4	292	1.00E-10	1.00E-10	1.73E-07	0.00E+00
25	5	293	1.00E-10	1.00E-10	1.74E-07	0.00E+00
25	6	294	1.00E-10	1.00E-10	1.62E-07	0.00E+00
25	7	295	1.00E-10	1.00E-10	1.69E-07	0.00E+00
25	8	296	1.00E-10	1.00E-10	1.70E-07	0.00E+00
25	9	297	1.00E-10	1.00E-10	1.70E-07	0.00E+00
25	10	298	1.00E-10	1.00E-10	1.71E-07	0.00E+00
25	11	299	1.00E-10	1.00E-10	1.70E-07	0.00E+00
25	12	300	1.00E-10	1.00E-10	1.70E-07	0.00E+00

Table 6. Calculation of Dilution Term:**1. Dilution Factor: $1 + Kd/iL$**

K = Hydraulic conductivity

i = Hydraulic gradient

d = Depth of mixing in ground water

L = Infiltration rate to aquifer

L = Length of contaminant source area

2. NIROP data (from *Remedial Investigation Report for the Soils Operable Unit at the Naval Industrial Ordnance Plant, September, 1993*)

K = 662256 cm/yr

i = 0.0005 cm/cm

d = 12.5 feet*

L = 16.7 cm/yr*

L = 24384 cm

$$Kd/iL = (662256)(0.0005)(381)/(16.7)(24384) = 1.31$$

Table 7. Calculation of Soil Cleanup Numbers

Compound	Compound			
	TOE	PCE	BCE	TCA
Csi	1.156	0.0176	1.299	(No leaching predicted)
HRL	0.005	0.005	0.07	
Csf	0.01391	0.007681	0.149	
(Csi)(HRL)/(Csf)	0.415528	0.011457	0.610268	
DAF	1.31	1.31	1.31	
Soil Cleanup Number	0.544342	0.015008	0.799452	

Fig. 1. Actual Contaminant Concentrations in OU2 Soil (1991 data).

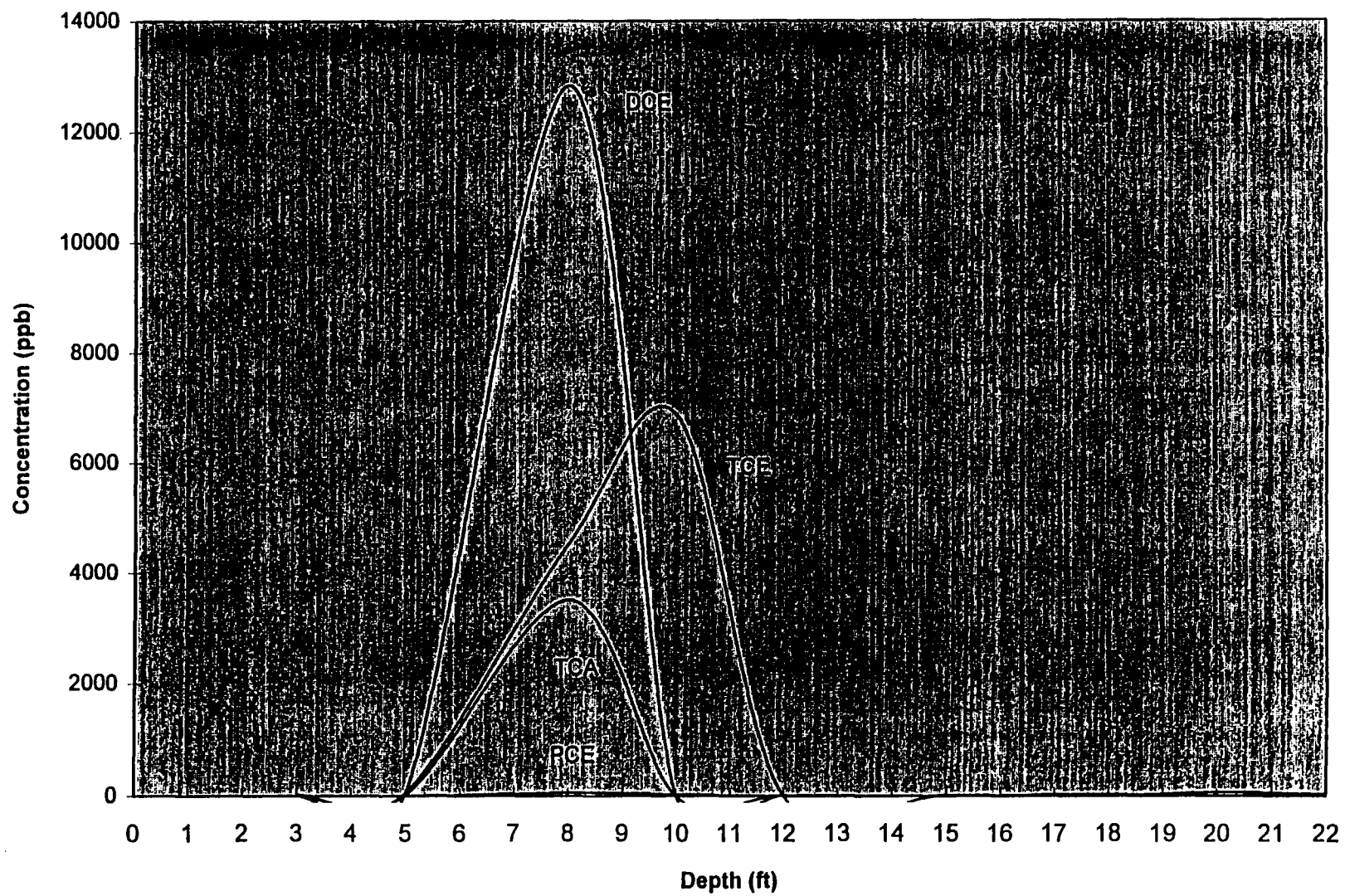


Fig. 2. Predicted Leachate at 20 ft (water table) versus Time

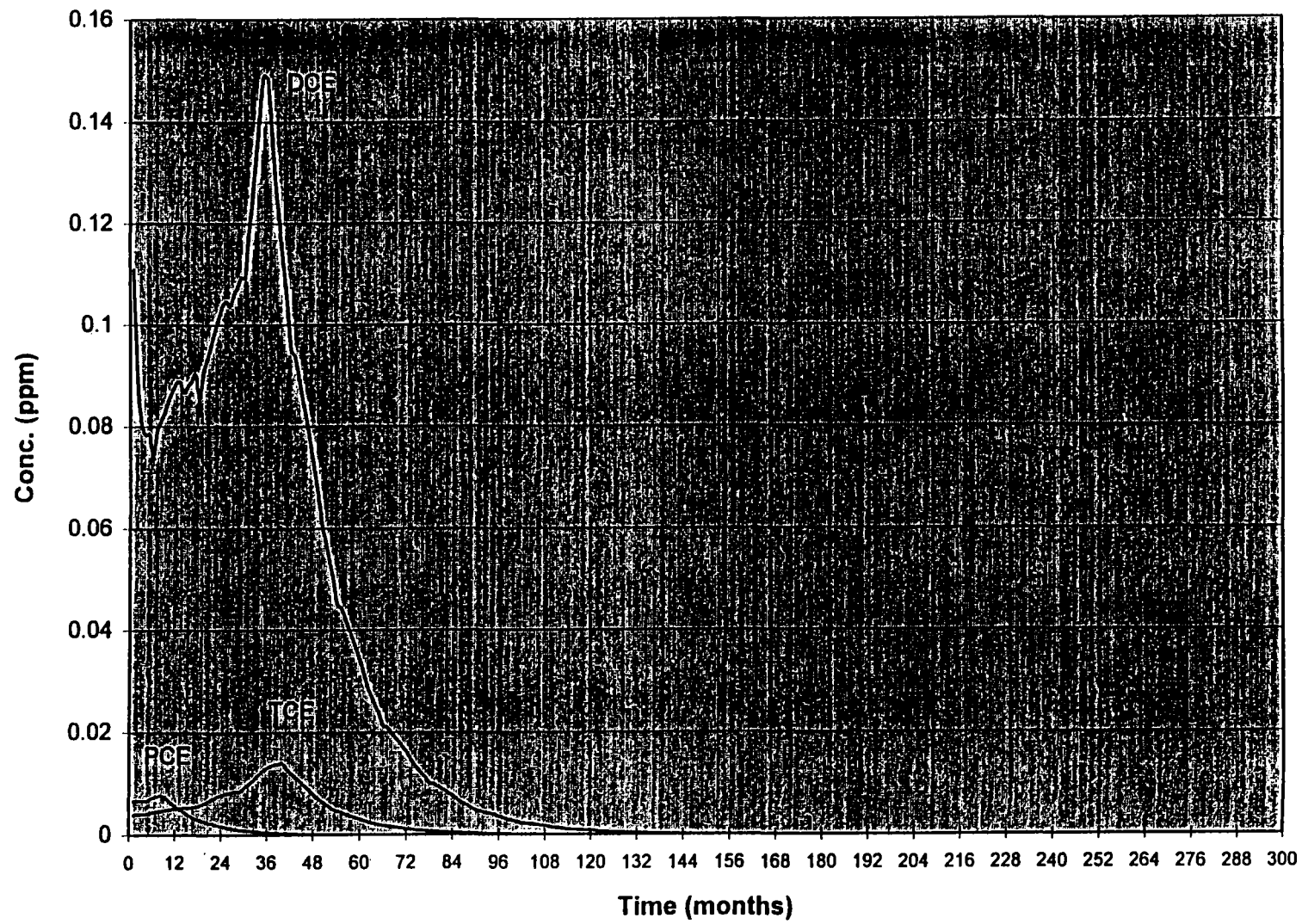


Fig. 3. Predicted PCE Leachate at 20 ft (water table) versus Time

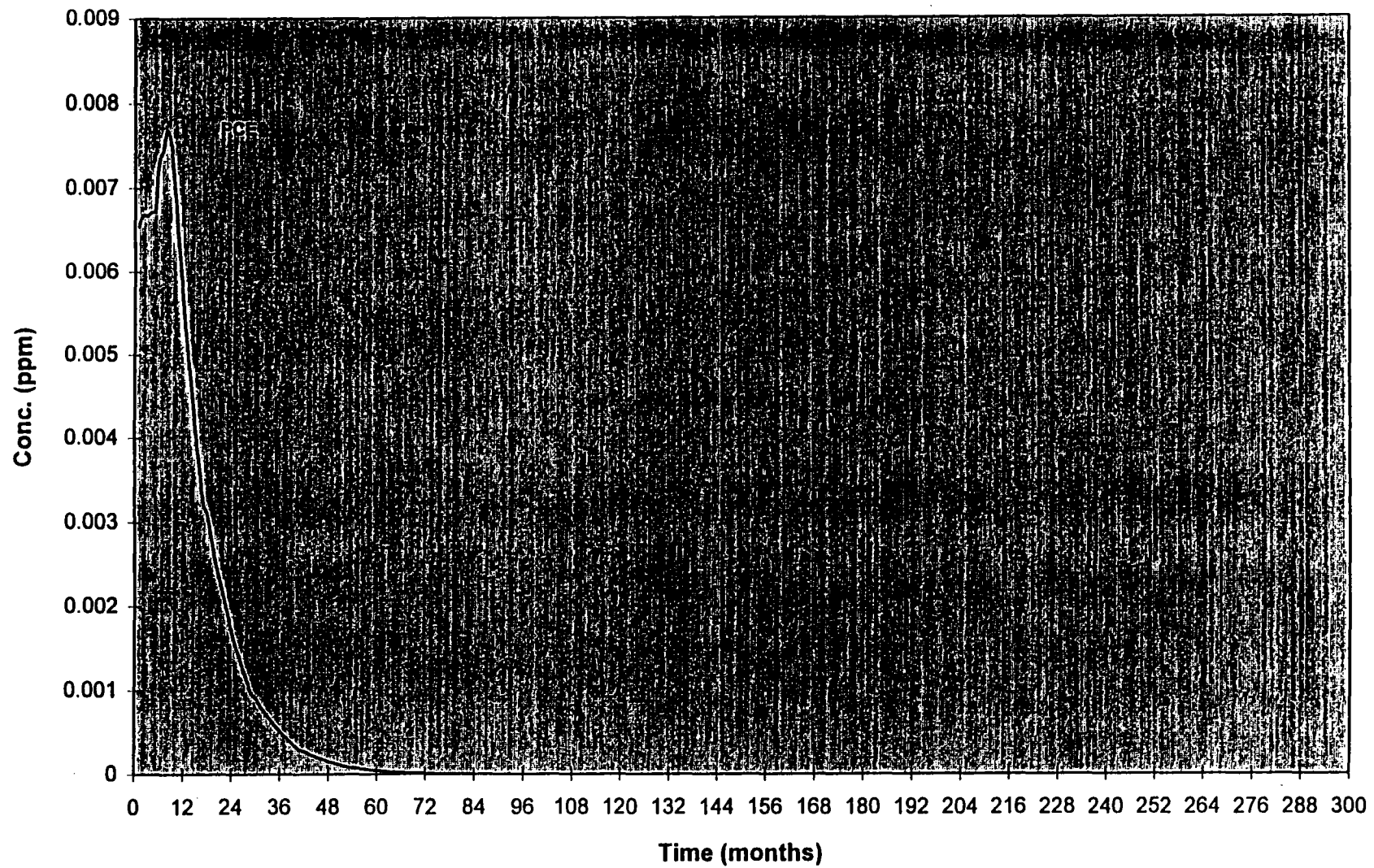
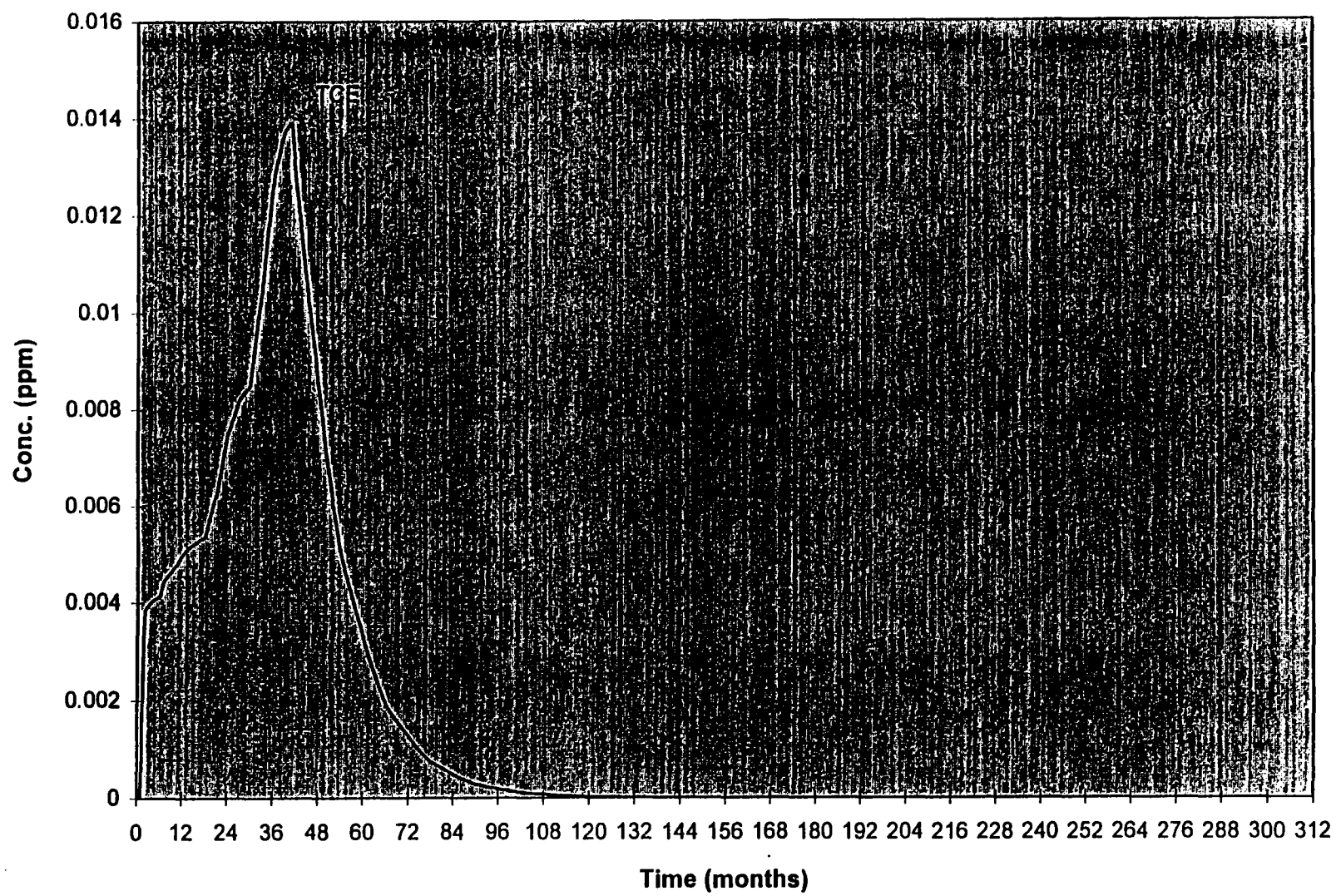


Fig. 4. Predicted TCE Leachate at 20 ft (water table) versus Time



ATTACHMENT 1

Specific soil and chemical SESOIL model input values

***** MONTHLY SESOIL MODEL OPERATION *****
MONTHLY SITE SPECIFIC SIMULATION

REGION : MINN-ST PAUL WSO AP
SOIL TYPE : sand
COMPOUND : TCE
WASHLOAD DATA :
APPLICATION AREA: NIROP TCE: Actual Site Concentrations by Depth

GENERAL INPUT PARAMETERS

-- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 4.70
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): 1.00
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00

1

-- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML): .110E+04
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .810E-01
HENRYS LAW CONSTANT (M**3-ATM/MOLE): .117E-01
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 171.
ADSORPTION COEFFICIENT ON SOIL (K): .000
MOLECULAR WEIGHT (G/MOL): 131.
VALENCE (-): .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
DEGRADATION RATE IN MOISTURE (/DAY): .000
DEGRADATION RATE ON SOIL (/DAY): .000
LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
YEARS TO BE SIMULATED: 25
AREA (CM**2): 0.410E+08
APPLICATION AREA LATITUDE (DEG.): 44.9
SPILL (1) OR STEADY APPLICATION (0): 0
MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0

INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 91. 0.15E+03 0.12E+03 0.24E+03
 NUMBER OF SUBLAYERS/LAYER 10 10 10 10
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.10E-07 0.10E-07 0.10E-07 0.10E-07
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.54 0.26 0.23
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1

YEAR - 1 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS --

	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
TEMP. (DEG C)	19.830	14.280	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830
CLOUD CVR (FRAC.)	0.500	0.550	0.550	0.600	0.700	0.600	0.700	0.600	0.600	0.600	0.600	0.600
REL. HUM.(FRAC.)	0.700	0.700	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700
ALBEDO (-)	0.160	0.160	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	9.070	6.110	4.790	3.680	0.500	0.500	0.500	10.260	5.320	8.210	9.950	8.950
M.TIME RAIN(DAYS)	0.250	0.320	0.370	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330
M. STORM NO. (-)	5.890	5.220	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02	3.40E-02

LAYER 2:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
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INITIAL CONC. (UG/ML) 8.80E-02 8.80E-02 8.80E-02 8.80E-02 8.80E-02 7.26E+00 7.26E+00
7.26E+00 7.26E+00 7.26E+00

LAYER 3:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03

LAYER 4:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	2.10E-02	2.10E-02	2.10E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02	3.20E-03	3.20E-03	3.20E-03

***** MONTHLY SESOIL MODEL OPERATION *****
MONTHLY SITE SPECIFIC SIMULATION

REGION : MINN-ST PAUL WSO AP
SOIL TYPE : sand
COMPOUND : DCE
WASHLOAD DATA :
APPLICATION AREA: NIROP DCE: Actual soil concentrations by depth

GENERAL INPUT PARAMETERS

-- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 4.70
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): 1.00
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00

1

-- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML): 600.
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .790E-01
HENRYS LAW CONSTANT (M**3-ATM/MOLE): .532E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 94.0
ADSORPTION COEFFICIENT ON SOIL (K): .000
MOLECULAR WEIGHT (G/MOL): 96.9
VALENCE (-): .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
DEGRADATION RATE IN MOISTURE (/DAY): .000
DEGRADATION RATE ON SOIL (/DAY): .000
LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
YEARS TO BE SIMULATED: 25
AREA (CM**2): 0.410E+08
APPLICATION AREA LATITUDE (DEG.): 44.9
SPILL (1) OR STEADY APPLICATION (0): 0
MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0

INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 91. 0.15E+03 0.12E+03 0.24E+03
 NUMBER OF SUBLAYERS/LAYER 10 10 10 10
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.10E-07 0.10E-07 0.10E-07 0.10E-07
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.54 0.26 0.23
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1

YEAR - 1 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS --

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
TEMP. (DEG C)	19.830	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830	
CLOUD CVR (FRAC.)	0.500	0.550	0.600	0.700	0.600	0.700	0.600	0.600	0.600	0.600	0.600	
REL. HUM.(FRAC.)	0.700	0.700	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700
ALBEDO (-)	0.160	0.160	0.160	0.240	0.280	0.280	0.300	0.190	0.160	0.160	0.160	
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	9.070	4.790	3.680	0.500	0.500	0.500	10.260	5.320	8.210	9.950	8.950	
M.TIME RAIN(DAYS)	0.250	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330		
M. STORM NO. (-)	5.890	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600	
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML,INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

LAYER 2:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
----------	---	---	---	---	---	---	---	---	---	----

INITIAL CONC. (UG/ML) 5.10E-02 5.10E-02 5.10E-02 5.10E-02 5.10E-02 2.05E+01 2.05E+01
2.05E+01 2.05E+01 2.05E+01

LAYER 3:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-02	1.30E-02
	1.30E-02	1.30E-02	1.30E-02							

LAYER 4:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	9.60E-03	9.60E-03	9.60E-03	1.10E-01	1.10E-01	1.10E-01	1.10E-01
	1.10E-01	1.10E-01	1.10E-01							

***** MONTHLY SESOIL MODEL OPERATION *****
MONTHLY SITE SPECIFIC SIMULATION

REGION : MINN-ST PAUL WSO AP
SOIL TYPE : sand
COMPOUND : TCA
WASHLOAD DATA :
APPLICATION AREA: NIROP TCA: Actual soil concentration by depth

GENERAL INPUT PARAMETERS

-- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 4.70
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): 1.00
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00
1

-- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML): .149E+04
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .800E-01
HENRY'S LAW CONSTANT (M**3-ATM/MOLE): .408E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 126.
ADSORPTION COEFFICIENT ON SOIL (K): .000
MOLECULAR WEIGHT (G/MOL): 133.
VALENCE (-): .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
DEGRADATION RATE IN MOISTURE (/DAY): .000
DEGRADATION RATE ON SOIL (/DAY): .000
LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
YEARS TO BE SIMULATED: 25
AREA (CM**2): 0.410E+08
APPLICATION AREA LATITUDE (DEG.): 44.9
SPILL (1) OR STEADY APPLICATION (0): 0

MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0
 INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 91. 0.15E+03 0.12E+03 0.24E+04
 NUMBER OF SUBLAYERS/LAYER 10 10 10 10
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.10E-07 0.10E-07 0.10E-07 0.10E-07
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.54 0.26 0.23
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1

YEAR - 1 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS --

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
TEMP. (DEG C)	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830		
	19.830	14.280										
CLOUD CVR (FRAC.)	0.550	0.550	0.600	0.700	0.600	0.700	0.600	0.600	0.600	0.600	0.600	
REL. HUM.(FRAC.)	0.700	0.700	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700
ALBEDO (-)	0.160	0.160	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	4.790	9.070	6.110	3.680	0.500	0.500	0.500	10.260	5.320	8.210	9.950	8.950
M.TIME RAIN(DAYS)	0.460	0.250	0.320	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330	
M. STORM NO. (-)	3.440	5.890	5.220	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03	3.20E-03

LAYER 2:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
----------	---	---	---	---	---	---	---	---	---	----

INITIAL CONC. (UG/ML) 1.30E-02 1.30E-02 1.30E-02 1.30E-02 1.30E-02 5.61E+00 5.61E+00
5.61E+00 5.61E+00 5.61E+00

LAYER 3:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00							

LAYER 4:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00							

***** MONTHLY SESOIL MODEL OPERATION *****
MONTHLY SITE SPECIFIC SIMULATION

REGION : MINN-ST PAUL WSO AP
SOIL TYPE : sand
COMPOUND : PCE
WASHLOAD DATA :
APPLICATION AREA: NIROP PCE: Actual soil concentrations by depth

GENERAL INPUT PARAMETERS

-- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 4.70
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): 1.00
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00

1

-- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML): 150.
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .720E-01
HENRYS LAW CONSTANT (M**3-ATM/MOLE): .287E-01
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 279.
ADSORPTION COEFFICIENT ON SOIL (K): .000
MOLECULAR WEIGHT (G/MOL): 166.
VALENCE (-): .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
DEGRADATION RATE IN MOISTURE (/DAY): .000
DEGRADATION RATE ON SOIL (/DAY): .000
LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
YEARS TO BE SIMULATED: 25
AREA (CM**2): 0.410E+08
APPLICATION AREA LATITUDE (DEG.): 44.9
SPILL (1) OR STEADY APPLICATION (0): 0

MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0
 INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 91. 0.15E+03 0.12E+03 0.24E+03
 NUMBER OF SUBLAYERS/LAYER 10 10 10 10
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.10E-07 0.10E-07 0.10E-07 0.10E-07
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.54 0.26 0.23
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1

YEAR - 1 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS --

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
TEMP. (DEG C)	19.830	14.280	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830
CLOUD CVR (FRAC.)	0.500	0.550	0.600	0.550	0.600	0.700	0.600	0.600	0.600	0.600	0.600	0.600
REL. HUM.(FRAC.)	0.700	0.700	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700
ALBEDO (-)	0.160	0.160	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	9.070	6.110	4.790	3.680	0.500	0.500	0.500	10.260	5.320	8.210	9.950	8.950
M.TIME RAIN(DAYS)	0.250	0.320	0.370	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330
M. STORM NO. (-)	5.890	5.220	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

LAYER 2:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
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INITIAL CONC. (UG/ML) 1.10E-02 1.10E-02 1.10E-02 1.10E-02 1.10E-02 9.90E-02 9.90E-02 9.90E-02 9.90E-02 9.90E-02

LAYER 3:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	3.20E-03	3.20E-03	3.20E-03	3.20E-03

LAYER 4:

SUBLAYER	1	2	3	4	5	6	7	8	9	10
INITIAL CONC. (UG/ML)	3.20E-03	3.20E-03	3.20E-03	6.20E-02	6.20E-02	6.20E-02	9.60E-03	9.60E-03	9.60E-03	9.60E-03



Brown & Root Environmental

Foster Plaza VII
661 Andersen Drive
Pittsburgh, PA 15220-2745

(412) 921-7090
FAX: (412) 921-4040

C-49-01-7-077

January 10, 1997

TO: DISTRIBUTION

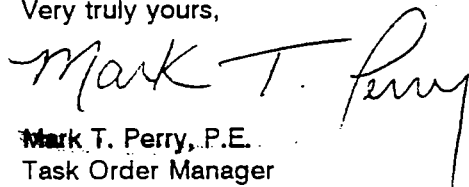
Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0003

Subject: Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota
OU3 RI/FS
January 9, 1997 Telephone Conference Call Summary

As directed by the Navy, per reference contract, attached are minutes from the January 9, 1997 telephone conference call to discuss the development of soil cleanup numbers which are based on the protection of groundwater.

Please contact me at (412) 921-7217 if you have any questions or comments.

Very truly yours,



Mark T. Perry, P.E.
Task Order Manager

MTP/dt

Enclosure

Distribution
Scott Glass, SOUTHNAVFACENGCOM
Tom Bloom, U.S.EPA
Dave Douglas, MPCA

TELEPHONE CONFERENCE CALL SUMMARY

Naval Industrial Reserve Ordnance Plant (NIROP) Fridley
Operable Unit 3 (OU3)
Remedial Investigation/Feasibility Study (RI/FS)

Discussion Topic

- Development of soil cleanup numbers which are based on the protection of groundwater.

Date

January 9, 1997

Participants

Scott Glass	Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM)
Dave Douglas	Minnesota Pollution Control Agency (MPCA)
John Betcher	MPCA
Mark Ferrey	MPCA
Rick Jolley	MPCA
Lifeng Guo	MPCA
Mark Perry	Brown & Root Environmental (B&R Environmental)
J.D. Chiou	B&R Environmental

Agenda

1. Selection of the representative hydraulic conductivity and groundwater gradient.
2. Calculation of groundwater mixing depth.
3. Partitioning between dissolved and solid phases in the saturated zone.
4. Necessary justifications for constituent-specific decay half life.
5. Calculation of cleanup numbers for other OU2 COCs.
6. Calculation of cleanup numbers for soils beneath the building.

Discussion Outcomes

1. The MPCA will review groundwater flow rates cited in the Feasibility Study Addendum Report for the Remedial Investigation/Feasibility Study dated August 1988 by RMT, Inc. and the Evaluation of Groundwater Containment System Effectiveness dated July 1996 by RMT, Inc. to determine if the use of a higher flow rate is warranted.
2. The groundwater mixing depth will be 12.5 feet.
3. The MPCA will use the Analytical Transient, One-, Two-, and Three-Dimensional Model (AT123D) to incorporate partitioning between dissolved and solid phases in the saturated zone.
4. The MPCA requires microcosm studies to justify the incorporation of decay rates.

5. The calculation of cleanup numbers for OU2 contaminants of concern (COCs) other than PCE, TCE, DCE and TCA is not necessary.
6. The calculation of cleanup numbers for soils beneath the main industrial plant building will be deferred until soil data from that area is obtained.

ATTN: Mark PERRY

FILE 6966 (CTN 2.03)
FILE #3.1~~Ferrey, Mark (GWSRS)~~

From: Mail Delivery Subsystem
To: mferrey
Subject: Returned mail: Host unknown
Date: Thursday, January 23, 1997 12:03PM

Thanks for the reply, Mark. All good questions.

While this is our draft policy (the edge of the source area), the Tier 3 level of modeling is meant to open these assumptions to discussion.

One major point to recognize is that we are discussing OU2 soils in the context of leaching to groundwater as a source area. This distinguishes our discussion of this point of compliance from OU1, since in that case we are talking about containment. For OU2, we are trying to ascertain the risk the soils pose as a source of contamination to the groundwater, so feel the area boundaries as the 'compliance' point is accurate and reasonable in this context. In other words, the point of compliance for these soils at this site and other sites is where the contaminated soils contribute to ground water contamination, whereas the point of compliance for ground water is the NIROP property line as stated in the ROD. This remedy was always viewed as an interim response to prevent ground water from getting in the Mississippi River and from there into the intake of the Minneapolis water supply.

John took a look at the groundwater data used in the dilution terms. We basically agree that there is an argument to be made to increase the groundwater velocity as long as the pumping AT-4 continues. John finds that, without pumping AT-4, the velocity under OU2 is 19 ft/year using data in the July 1988 report. (gradient measured between 1-S and 3-S; gradient = 0.00017 and a geometric mean of the hydraulic conductivity = 94 ft/day). With pumping, John calculated the gradient as 0.005 and the same hydraulic conductivity of 94 ft/day, the velocity is 573 ft/yr.

We recommend using the pumping induced gradient to calculate the velocity term in the dilution factor, with the caveat that if AT-4 is stopped, the cleanup number calculated from the lower dilution term be used to revisit the remedy for OU2.

2. With regard to the monthly "exposure" points, we are using this information to determine whether leaching results in exceedences of the MCL or HRL (ARAR) after the appropriate dilution. The Minnesota Dept. of Health HRLs ARE risk assessment numbers; the policy that we are following - for the purpose of back-calculating from groundwater concentrations - is to take that peak concentration as indication that a problem exists in the soil as a source of contamination to ground water. So we do not agree that a "risk assessment" is needed for this matter, because the groundwater HRLs serve us in this regard.

Mark

From: Mark Perry
To: mferrey
Subject: RE: Dilution rate.
Date: Monday, January 13, 1997 1:09PM
Priority: High

Mark,

Usually, we develop soil cleanup numbers based on groundwater/compliance points ranging from edge of the surface source area, edge of existing plume,

nearest groundwater discharge point, property line, to existing or potential future drinking water well locations. For Fridley, we ran the numbers at both the edge of the surface source area and at the property line. We would prefer the use of the property line, because we cannot control groundwater use beyond that point (and the property line appears to be the OU1 compliance boundary), however we know that the MPCA required the use of the edge of the surface source area when the numbers were developed for OU2. Is this MPCA policy that is not open for discussion?

There is another issue that we did not discuss. The issue is groundwater exposure time frame. The MPCA used the simulated maximum monthly groundwater concentrations to back calculate soil cleanup numbers. One month is a relatively short time frame in typical human health risk assessment calculations. Would the MPCA consider the use of a maximum lifetime (or any other time frame between one month and a lifetime) average exposure concentration?

Thanks,

Mark

From: mferrey
To: mark perry
Subject: Dilution rate.
Date: Friday, January 10, 1997 11:11AM

Mark, we are looking at the reference that J D recommended and agree that there is some justification for increasing the flow rate for groundwater velocity. Need to talk to a couple of others before letting you know what we agree to -
Are we in agreement that the compliance boundary is the vertical boundary of

the source area? I'm not sure that we discussed this during our meeting.
Thus, we are looking at the dilution term under the OU2 source area only - not the entire site.

Mark

Post-it* Fax Note	7671	Date 1-27-97	# of pages 2
To Mark Ferrey		From John Betcher	
Co/Dept		Co. MPCA	
Phone # 921-7217		Phone # (612) 296-7821	
Fax # (412) 921-4040		Fax # (612) 296-9707	

DEPARTMENT: POLLUTION CONTROL AGENCY

Office Memorandum

DATE: January 10, 1997

TO: Mark Ferrey

FROM: John Betcher - Site Hydrogeologist

PHONE: 612-296-7821

SUBJECT: Average Linear Ground Water Velocity for Soil Leaching Model

Mark - I've calculated the average linear velocities for shallow ground water for Area A in the North 40 at the Navy/NIROP site in Fridley, MN. I have calculated the velocity 2 ways. The first is from 1988 equipotential maps constructed for pre-pumping conditions. The second was calculated for the data contained in the 1995 Annual Report for Ground Water which includes equipotential maps which are influenced by pumping of shallow ground water recovery well AT-4, which is part of the ground water recovery system that is part of the OU1 Ground Water remedy. The resulting average linear velocities are quite different due to the changes in gradient due to pumping.

Pre-Pumping Average Linear Velocity for Shallow Ground Water

For this calculation I used data from the Addendum to the Remedial Investigation Report for the Remedial Investigation/Feasibility Study at the NIROP, Fridley, dated July 1988. The gradient was calculated from Figure 5-5 of the document and was measured between well 1-S and well 3-S. The resulting gradient is 0.00017. Although the in-situ permeability tests on five shallow wells yielded a range of hydraulic conductivity's of between 16 - 540 ft/day the geometric mean was used which is 94 ft/day. A porosity of 0.30 was used. The calculation is as follows:

$$v = \frac{K}{n} \frac{dh}{dl} \quad v = \frac{94 \text{ ft/day}}{0.30} \frac{0.12 \text{ feet}}{700 \text{ feet}} \quad v = 19.44 \text{ ft/year}$$

The velocity of shallow ground water may be faster or slower than the calculated average linear velocity due to the wide range in measured hydraulic conductivities.

Page 2

Pumping Conditions

For this calculation I used data from the Annual Monitoring Report for 1995 - Groundwater Extraction and Pretreatment System dated August 1995. The gradient was calculated from Figure 4-1 of the document and was measured between wells 1-S and well 3-S. The resulting gradient is 0.005. Although the in-situ permeability tests on five shallow wells yielded a range of hydraulic conductivity's of between 16 - 540 ft/day the geometric mean was used which is 94 ft/day. A porosity of 0.30 was used. The calculation is as follows:

$$v = \frac{K}{n} \frac{dh}{dl} \quad v = \frac{94 \text{ ft/day}}{0.30} \frac{3.84 \text{ feet}}{700 \text{ feet}} \quad v = 573.05 \text{ ft/year}$$

The velocity of shallow ground water may be faster or slower than the calculated average linear velocity due to the wide range in measured hydraulic conductivities.

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT U.S. Navy / NIDOP Friday		JOB NUMBER 6966	
SUBJECT Soil Cleanup Numbers			
BASED ON		DRAWING NUMBER	
BY Mark Perry	CHECKED BY	APPROVED BY	DATE 2/5/97

Mark,
Please find our work attached for your approval. Hopefully you can have someone look at this Thursday and we can resolve any issues Thursday afternoon.

Thanks,
Mark

UPDATED NIROP SOIL CLEANUP GOALS

SUMMARY

Two modifications were made in the soil cleanup goal calculation procedure originally used by the MPCA. The first modification was made in order to consider a higher groundwater velocity that is representative of the conditions at the site when the groundwater recovery well system is in operation. This induced higher groundwater seepage velocity for pumping conditions is 573 ft/yr as determined by the MPCA (e-mail dated January 23, 1997). Instead of assuming all the mass of a contaminant in soil leachate will remain in dissolved phase after reaching the groundwater table, the second modification incorporated the partitioning process between dissolved and adsorbed phases in the saturated zone under the source area. These two modifications were conceptually agreed upon between the MPCA and Navy during a conference call held on January 10, 1997. This memo summarizes the resultant DAFs and soil cleanup goals for TCE, DCE, and PCE based on the representative soil contamination profiles used in the original MPCA report. MPCA already concluded that TCA will not produce unacceptable leachate, therefore, it was not further evaluated.

Table 1 lists the DAFs and soil cleanup goals from two new approaches as well as the corresponding original MPCA values.

TABLE 1 - SUMMARY OF DAF AND SOIL CLEANUP GOAL

APPROACH	TCE		PCE		DCE	
	DAF	GOAL (mg/kg)	DAF	GOAL (mg/kg)	DAF	GOAL (mg/kg)
MPCA Original Approach	1.31	0.544	1.31	0.015	1.31	0.799
Pumping Conditions	5.90	2.450	5.90	0.070	5.90	3.600
Pumping Conditions with Saturated Zone Partitioning	12.00	4.986	24.00	0.275	9.89	6.036

No chemical decay, further downgradient transport, or calculated mixing depth in saturated zone were used in all three DAF and cleanup goal development approaches. The last approach is considered relatively more realistic among the three approaches and is still reasonably conservative. Therefore, the chemical-specific DAFs and soil cleanup goals developed considering the pumping conditions and saturated zone partitioning

will be used to support the future soil remedial decisions. The soil cleanup goals will be used as the acceptable upper bounds for any location-specific average soil column concentrations above groundwater table outside of the NIROP building.

A lower infiltration rate and chemical-specific soil column concentration profiles under the NIROP building will be required to develop the soil cleanup goals for soil under the building.

SUPPORTING TECHNICAL INFORMATION

Technical information regarding the revised DAF values and soil cleanup goals are briefly discussed. As mentioned earlier, two approaches were used to develop the new DAF values. The first uses the pumping induced higher groundwater seepage velocity of 573 ft/yr under the source area instead of the natural groundwater flow velocity. The second approach incorporates both the higher groundwater velocity and contaminant mass partitioning in the saturated zone.

The value of DAF considering a higher groundwater seepage velocity is calculated by the following equation:

$$\begin{aligned} \text{DAF} &= 1 + Kd/iL \\ &= 1 + (34310)(0.005)(12.5)/(0.548)(800) \\ &= 5.9 \end{aligned}$$

where $K = 94 \text{ ft/day} = 34310 \text{ ft/yr}$

$i = 0.005$

$d = 12.5 \text{ ft}$

$l = 16.7 \text{ cm/yr} = 0.548 \text{ ft/yr}$

$L = 800 \text{ feet}$

Effects due to partitioning of dissolved and adsorbed phase concentrations was estimated by using a simple mass balance equation which can incorporate the source leachate from unsaturated zone (i.e., Table 5, SESOIL model results provided by the MPCA) and the upgradient groundwater flow. Derivation of the mass balance equation of the saturated zone is presented in Attachment 1. This equation is implemented in an Excel spreadsheet. By using the chemical-specific SESOIL results as the time-varying loading term and the same hydrogeological parameters as used in the previous DAF calculation (i.e., considering pumping condition), the chemical-specific groundwater concentrations within the 12.5 ft mixing depth can be

estimated. The foc value in the saturated zone was assumed to be about 0.16 percent based on a measured value of 1660 mg/kg at 20 ft from ground surface. The estimated chemical-specific groundwater concentrations under the source area are provided in the three spreadsheets included in Attachment 2. The ratio between the maximum leachate concentration from SESOIL and the estimated maximum groundwater concentration for each chemical is the chemical-specific DAF value listed in Table 1. The soil cleanup goals listed in Table 1 are calculated by scaling the original MPCA values with the ratios between the new DAF values and the original DAF value (i.e., 1.31).

As shown in Attachment 2, the three chemical-specific soil concentration profiles used to develop the DAF values and soil cleanup goals will not create unacceptable groundwater concentrations in the upper 12.5 feet of the saturated zone. Although the maximum detected TCE and DCE concentrations (i.e., 6.858 and 12.828 mg/kg) exceed the chemical-specific cleanup goals (i.e., 4.986 and 6.036 mg/kg), the average residual soil concentrations for the entire soil boring (i.e., 1.156 and 1.299 mg/kg) are much lower than the cleanup goals and therefore do not have sufficient contaminant mass to impact the aquifer. The estimated maximum groundwater concentrations for TCE, PCE, and DCE are all lower than the chemical-specific water criteria (i.e., 5, 5, and 70 ug/l, respectively). These results indicate that the developed soil cleanup goals should be used as the acceptable upper bounds for any location-specific average soil column concentrations instead of the limits of maximum soil concentrations.

ATTACHMENT 1

SATURATED ZONE EQUATION

SATURATED ZONE EQUATION

Based on the mass-balance and mass partitioning in the saturated zone underlying the source area without considering dispersion, the governing equation for the movement of contaminant mass in the saturated mixing zone can be derived as:

$$Q_1 C_1 + Q_2 C_2 - [(Q_1 + Q_2) + (SV + K_d W) \lambda] C_3(t) = \frac{dC_3(t)}{dt} (SV + K_d W) \quad (1)$$

Each term and its physical meaning in the Eq.1 can be expressed as follows:

- Aqueous contaminant mass flow into the layer in unit time: $Q_1 C_1 + Q_2 C_2$
- Aqueous contaminant mass flow out the layer in unit time: $(Q_1 + Q_2) C_3(t)$ (i.e., $Q_3 C_3(t)$)
- Aqueous contaminant mass in the moisture: $SV C_3(t)$
- Aqueous contaminant mass absorbed on the soil: $K_d W C_3(t)$
- Total aqueous contaminant mass in the layer: $[SV + K_d W] C_3(t)$
- Aqueous contaminant mass change with time: $[SV + K_d W] \times dC_3(t)/dt$
- Aqueous contaminant mass decay: $[SV + K_d W] C_3(t) \lambda$

where: C_1 is the contaminant concentration flow into the layer (ug/L)

C_2 is the contaminant leachate concentration of the lateral source (ug/L)

C_3 is the aqueous concentration in the layer (ug/L)

Q_1 is the infiltration rate (L/day)

Q_2 is the lateral inflow rate (L/day)

$$Q_3 = Q_1 + Q_2$$

S is the soil saturation fraction in the layer (dimensionless and set equal to 1 for saturated zone)

V is the void volume in the layer (L)

K_d is the aqueous/solid phase distribution coefficient in the layer (L/kg)

W is the dry weight of soil in the layer (kg)

λ is the first-order chemical decay rate in the layer (day^{-1})

Eq.1 can be rewritten as

$$K_1 \frac{dC_3(t)}{dt} + K_2 C_3(t) = K_3 \quad (2)$$

In which $K_1 = SV + K_d W$

$$K_2 = Q_1 + Q_2 + K_1 \lambda$$

$$K_3 = Q_1 C_1 + Q_2 C_2$$

Eq. 2 can be analytically solved by assuming K_1 , K_2 and K_3 being constant. Eq.2 can be rewritten as

$$\frac{dC_3(t)}{dt} = \frac{K_2}{K_1} \left[\frac{K_3}{K_2} - C_3(t) \right] \quad (3)$$

Separate the variables by writing

$$\frac{dC_3(t)}{\frac{K_3}{K_2} - C_3(t)} = \frac{K_2}{K_1} dt \quad (4)$$

And integrate to get

$$\int \frac{dC_3(t)}{\frac{K_3}{K_2} - C_3(t)} = \int \frac{K_2}{K_1} dt \quad (5)$$

Or

$$-\ln \left[\frac{K_3}{K_2} - C_3(t) \right] = \frac{K_2}{K_1} t + A \quad (6)$$

Where A is a constant. Therefore

$$C_3(t) = \frac{K_3}{K_2} - \exp(-A) \times \exp \left[-\frac{K_2}{K_1} t \right] \quad (7)$$

When $t=0$, $C_3(t)=C_3(0)$, $\exp(-A)$ can be solved as

$$\exp(-A) = -C_3(0) + \frac{K_3}{K_2} \quad (8)$$

Substituting $\exp(-A)$ into Eq.7 yields

$$C_3(t) = \frac{K_3}{K_2} + (C_3(0) - \frac{K_3}{K_2}) \exp \left(-\frac{K_2}{K_1} t \right) \quad (9)$$

C_1 and C_2 are assumed constant in the above integration to obtain Eq.9. In most cases, C_1 and C_2 are time-varying variables. The continuous functions of the time-varying C_1 and C_2 can be approximated by the staircase functions. In each small time interval from $I\Delta t$ to $(I+1)\Delta t$, C_1 and C_2 are assumed as constant of $C_1(I\Delta t)$ and $C_2(I\Delta t)$, respectively. Under such assumption, Eq.9 can be written as

$$C_3((I+1)\Delta t) = \frac{K_3(I\Delta t)}{K_2} + \left[C_3(I\Delta t) - \frac{K_3(I\Delta t)}{K_2} \right] \exp\left(-\frac{K_2\Delta t}{K_1}\right) \quad (10)$$

Where: I is the time step, starting from $I=0$ (dimensionless),

Δt is the length of each time step,

$C_1(I\Delta t)$ is the contaminant concentration flow into the layer vertically at previous time,

$C_2(I\Delta t)$ is the contaminant concentration flow into the layer laterally at previous time,

$K_3(I\Delta t) = Q_1C_1(I\Delta t) + Q_2C_2(I\Delta t)$,

$C_3((I+1)\Delta t)$ is the aqueous concentration at the current time step, and

$C_3(I\Delta t)$ is the aqueous concentration at the previous time step,

All terms at the right side of the Eq.10 are known starting from $I=0$ with given $C_3(0)$. Therefore, the equations can be solved successively starting from $I=0$ until whole time period is covered. It is important to note that, because no chemical decay is considered, λ is set equal to 0 in this application. $C_1(t)$ is the output from the SESOIL model and $C_2(t)$ is assumed to be 0.

ATTACHMENT 2

CHEMICAL-SPECIFIC

SATURATED ZONE CONCENTRATIONS

SATURATED ZONE PARTITIONING				
SITE:		NIROP	Frately	CONTAMINANT: TCE
INVESTIGATOR:		LK		HALF-LIFE (YRS): 0.00E+00
DATE:		2/4/97		DAF 1.20E+01
SATURATED LAYER				
INFILT (FT/YR):		0.548	KOC	171
LENGTH (FT):		800	FOC	0.0016
WIDTH (FT):		400	Kd (L/KG):	2.74E-01
GROUNDWATER FLOW VELOCITY (FT/YR)		573	SATURATION:	1.00
POROSITY		0.3	THICKNESS (FT):	12.50
DENSITY(G/CM3):		1.60	DECAY (1/DAY):	0.00E+00
Q1 (L/DAY):		1.36E+04	C3o (PPB):	0.00E+00
			CU2 (PPB):	0.00E+00
			Q2 (L/DAY):	6.67E+04
TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3	
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)	
0.00	0	0.00E+00	0.00E+00	
0.08	1	3.78E+00	1.85E-02	
0.17	2	3.94E+00	3.72E-02	
0.25	3	4.02E+00	5.57E-02	
0.33	4	4.09E+00	7.41E-02	
0.42	5	4.14E+00	9.22E-02	
0.50	6	4.41E+00	1.11E-01	
0.58	7	4.53E+00	1.30E-01	
0.67	8	4.62E+00	1.49E-01	
0.75	9	4.73E+00	1.68E-01	
0.83	10	4.85E+00	1.86E-01	
0.92	11	4.98E+00	2.05E-01	
1.00	12	5.08E+00	2.24E-01	
1.08	13	5.15E+00	2.43E-01	
1.17	14	5.20E+00	2.61E-01	
1.25	15	5.26E+00	2.79E-01	
1.33	16	5.31E+00	2.97E-01	
1.42	17	5.36E+00	3.15E-01	
1.50	18	5.63E+00	3.33E-01	
1.58	19	5.94E+00	3.53E-01	
1.67	20	6.24E+00	3.73E-01	
1.75	21	6.61E+00	3.94E-01	
1.83	22	7.01E+00	4.17E-01	
1.92	23	7.41E+00	4.41E-01	
2.00	24	7.69E+00	4.66E-01	
2.08	25	7.91E+00	4.91E-01	
2.17	26	8.15E+00	5.17E-01	
2.25	27	8.28E+00	5.43E-01	
2.33	28	8.40E+00	5.68E-01	
2.42	29	8.49E+00	5.93E-01	
2.50	30	9.17E+00	6.21E-01	
2.58	31	9.75E+00	6.50E-01	

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
2.67	32	1.03E+01		6.82E-01
2.75	33	1.11E+01		7.16E-01
2.83	34	1.18E+01		7.53E-01
2.92	35	1.25E+01		7.93E-01
3.00	36	1.30E+01		8.34E-01
3.08	37	1.34E+01		8.75E-01
3.17	38	1.37E+01		9.17E-01
3.25	39	1.38E+01		9.58E-01
3.33	40	1.39E+01		9.98E-01
3.42	41	1.29E+01		1.03E+00
3.50	42	1.21E+01		1.06E+00
3.58	43	1.15E+01		1.09E+00
3.67	44	1.07E+01		1.11E+00
3.75	45	1.00E+01		1.13E+00
3.83	46	9.34E+00		1.14E+00
3.92	47	8.67E+00		1.15E+00
4.00	48	7.97E+00		1.15E+00
4.08	49	7.27E+00		1.16E+00
4.17	50	6.67E+00		1.16E+00
4.25	51	6.08E+00		1.15E+00
4.33	52	5.55E+00		1.15E+00
4.42	53	5.03E+00		1.14E+00
4.50	54	4.70E+00		1.13E+00
4.58	55	4.43E+00		1.12E+00
4.67	56	4.14E+00		1.10E+00
4.75	57	3.86E+00		1.09E+00
4.83	58	3.60E+00		1.08E+00
4.92	59	3.34E+00		1.06E+00
5.00	60	3.07E+00		1.05E+00
5.08	61	2.80E+00		1.03E+00
5.17	62	2.56E+00		1.01E+00
5.25	63	2.34E+00		9.96E-01
5.33	64	2.14E+00		9.78E-01
5.42	65	1.93E+00		9.59E-01
5.50	66	1.81E+00		9.40E-01
5.58	67	1.70E+00		9.21E-01
5.67	68	1.59E+00		9.02E-01
5.75	69	1.49E+00		8.84E-01
5.83	70	1.38E+00		8.65E-01
5.92	71	1.28E+00		8.46E-01
6.00	72	1.18E+00		8.28E-01
6.08	73	1.08E+00		8.09E-01
6.17	74	9.86E-01		7.91E-01
6.25	75	9.00E-01		7.72E-01
6.33	76	8.21E-01		7.54E-01
6.42	77	7.43E-01		7.36E-01
6.50	78	6.95E-01		7.18E-01
6.58	79	6.55E-01		7.01E-01
6.67	80	6.12E-01		6.83E-01
6.75	81	5.71E-01		6.66E-01
6.83	82	5.32E-01		6.50E-01
6.92	83	4.93E-01		6.34E-01
7.00	84	4.53E-01		6.18E-01
7.08	85	4.14E-01		6.02E-01
7.17	86	3.79E-01		5.86E-01
7.25	87	3.46E-01		5.71E-01

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
7.33	88	3.16E-01		5.56E-01
7.42	89	2.86E-01		5.42E-01
7.50	90	2.67E-01		5.27E-01
7.58	91	2.52E-01		5.13E-01
7.67	92	2.35E-01		5.00E-01
7.75	93	2.20E-01		4.86E-01
7.83	94	2.05E-01		4.73E-01
7.92	95	1.90E-01		4.61E-01
8.00	96	1.74E-01		4.48E-01
8.08	97	1.59E-01		4.36E-01
8.17	98	1.46E-01		4.24E-01
8.25	99	1.33E-01		4.13E-01
8.33	100	1.21E-01		4.01E-01
8.42	101	1.10E-01		3.90E-01
8.50	102	1.03E-01		3.80E-01
8.58	103	9.68E-02		3.69E-01
8.67	104	9.04E-02		3.59E-01
8.75	105	8.44E-02		3.49E-01
8.83	106	7.86E-02		3.39E-01
8.92	107	7.29E-02		3.30E-01
9.00	108	6.69E-02		3.21E-01
9.08	109	6.11E-02		3.12E-01
9.17	110	5.60E-02		3.03E-01
9.25	111	5.11E-02		2.95E-01
9.33	112	4.66E-02		2.86E-01
9.42	113	4.22E-02		2.78E-01
9.50	114	3.94E-02		2.70E-01
9.58	115	3.72E-02		2.63E-01
9.67	116	3.47E-02		2.55E-01
9.75	117	3.24E-02		2.48E-01
9.83	118	3.02E-02		2.41E-01
9.92	119	2.80E-02		2.34E-01
10.00	120	2.57E-02		2.28E-01
10.08	121	2.34E-02		2.21E-01
10.17	122	2.15E-02		2.15E-01
10.25	123	1.96E-02		2.09E-01
10.33	124	1.79E-02		2.03E-01
10.42	125	1.62E-02		1.97E-01
10.50	126	1.51E-02		1.92E-01
10.58	127	1.42E-02		1.86E-01
10.67	128	1.33E-02		1.81E-01
10.75	129	1.24E-02		1.76E-01
10.83	130	1.15E-02		1.71E-01
10.92	131	1.07E-02		1.66E-01
11.00	132	9.81E-03		1.61E-01
11.08	133	8.95E-03		1.57E-01
11.17	134	8.20E-03		1.52E-01
11.25	135	7.47E-03		1.48E-01
11.33	136	6.81E-03		1.43E-01
11.42	137	6.16E-03		1.39E-01
11.50	138	5.75E-03		1.35E-01
11.58	139	5.42E-03		1.32E-01
11.67	140	5.05E-03		1.28E-01
11.75	141	4.71E-03		1.24E-01
11.83	142	4.38E-03		1.21E-01
11.92	143	4.05E-03		1.17E-01

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
12.00	144	3.71E-03		1.14E-01
12.08	145	3.39E-03		1.10E-01
12.17	146	3.10E-03		1.07E-01
12.25	147	2.82E-03		1.04E-01
12.33	148	2.57E-03		1.01E-01
12.42	149	2.32E-03		9.83E-02
12.50	150	2.16E-03		9.55E-02
12.58	151	2.03E-03		9.28E-02
12.67	152	1.89E-03		9.01E-02
12.75	153	1.75E-03		8.75E-02
12.83	154	1.63E-03		8.50E-02
12.92	155	1.51E-03		8.26E-02
13.00	156	1.38E-03		8.02E-02
13.08	157	1.25E-03		7.79E-02
13.17	158	1.14E-03		7.57E-02
13.25	159	1.03E-03		7.35E-02
13.33	160	9.35E-04		7.14E-02
13.42	161	8.39E-04		6.93E-02
13.50	162	7.77E-04		6.73E-02
13.58	163	7.32E-04		6.54E-02
13.67	164	6.76E-04		6.35E-02
13.75	165	6.20E-04		6.17E-02
13.83	166	5.70E-04		5.99E-02
13.92	167	5.23E-04		5.82E-02
14.00	168	4.76E-04		5.65E-02
14.08	169	4.27E-04		5.49E-02
14.17	170	3.90E-04		5.33E-02
14.25	171	3.49E-04		5.18E-02
14.33	172	3.09E-04		5.03E-02
14.42	173	2.71E-04		4.88E-02
14.50	174	2.50E-04		4.74E-02
14.58	175	2.25E-04		4.61E-02
14.67	176	1.99E-04		4.47E-02
14.75	177	1.77E-04		4.34E-02
14.83	178	1.56E-04		4.22E-02
14.92	179	1.36E-04		4.10E-02
15.00	180	1.16E-04		3.98E-02
15.08	181	9.93E-05		3.87E-02
15.17	182	8.50E-05		3.75E-02
15.25	183	7.00E-05		3.65E-02
15.33	184	5.50E-05		3.54E-02
15.42	185	4.10E-05		3.44E-02
15.50	186	3.50E-05		3.34E-02
15.58	187	2.55E-05		3.24E-02
15.67	188	1.70E-05		3.15E-02
15.75	189	9.50E-06		3.06E-02
15.83	190	2.00E-06		2.97E-02
15.92	191	1.00E-07		2.89E-02
16.00	192	1.00E-07		2.80E-02
16.08	193	1.00E-07		2.72E-02
16.17	194	1.00E-07		2.64E-02
16.25	195	1.00E-07		2.57E-02
16.33	196	1.00E-07		2.49E-02
16.42	197	1.00E-07		2.42E-02
16.50	198	1.00E-07		2.35E-02
16.58	199	1.00E-07		2.28E-02

TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)
16.67	200	1.00E-07	2.22E-02
16.75	201	1.00E-07	2.15E-02
16.83	202	1.00E-07	2.09E-02
16.92	203	1.00E-07	2.03E-02
17.00	204	1.00E-07	1.97E-02
17.08	205	1.00E-07	1.92E-02
17.17	206	1.00E-07	1.86E-02
17.25	207	1.00E-07	1.81E-02
17.33	208	1.00E-07	1.76E-02
17.42	209	1.00E-07	1.70E-02
17.50	210	1.00E-07	1.66E-02
17.58	211	1.00E-07	1.61E-02
17.67	212	1.00E-07	1.56E-02
17.75	213	1.00E-07	1.52E-02
17.83	214	1.00E-07	1.47E-02
17.92	215	1.00E-07	1.43E-02
18.00	216	1.00E-07	1.39E-02
18.08	217	1.00E-07	1.35E-02
18.17	218	1.00E-07	1.31E-02
18.25	219	1.00E-07	1.27E-02
18.33	220	1.00E-07	1.24E-02
18.42	221	1.00E-07	1.20E-02
18.50	222	1.00E-07	1.17E-02
18.58	223	1.00E-07	1.13E-02
18.67	224	1.00E-07	1.10E-02
18.75	225	1.00E-07	1.07E-02
18.83	226	1.00E-07	1.04E-02
18.92	227	1.00E-07	1.01E-02
19.00	228	1.00E-07	9.78E-03
19.08	229	1.00E-07	9.50E-03
19.17	230	1.00E-07	9.23E-03
19.25	231	1.00E-07	8.96E-03
19.33	232	1.00E-07	8.70E-03
19.42	233	1.00E-07	8.45E-03
19.50	234	1.00E-07	8.21E-03
19.58	235	1.00E-07	7.97E-03
19.67	236	1.00E-07	7.74E-03
19.75	237	1.00E-07	7.52E-03
19.83	238	1.00E-07	7.30E-03
19.92	239	1.00E-07	7.09E-03
20.00	240	1.00E-07	6.89E-03
20.08	241	1.00E-07	6.69E-03
20.17	242	1.00E-07	6.50E-03
20.25	243	1.00E-07	6.31E-03
20.33	244	1.00E-07	6.13E-03
20.42	245	1.00E-07	5.95E-03
20.50	246	1.00E-07	5.78E-03
20.58	247	1.00E-07	5.61E-03
20.67	248	1.00E-07	5.45E-03
20.75	249	1.00E-07	5.29E-03
20.83	250	1.00E-07	5.14E-03
20.92	251	1.00E-07	4.99E-03
21.00	252	1.00E-07	4.85E-03
21.08	253	1.00E-07	4.71E-03
21.17	254	1.00E-07	4.57E-03
21.25	255	1.00E-07	4.44E-03

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
21.33	256	1.00E-07		4.31E-03
21.42	257	1.00E-07		4.19E-03
21.50	258	1.00E-07		4.07E-03
21.58	259	1.00E-07		3.95E-03
21.67	260	1.00E-07		3.84E-03
21.75	261	1.00E-07		3.73E-03
21.83	262	1.00E-07		3.62E-03
21.92	263	1.00E-07		3.52E-03
22.00	264	1.00E-07		3.42E-03
22.08	265	1.00E-07		3.32E-03
22.17	266	1.00E-07		3.22E-03
22.25	267	1.00E-07		3.13E-03
22.33	268	1.00E-07		3.04E-03
22.42	269	1.00E-07		2.95E-03
22.50	270	1.00E-07		2.87E-03
22.58	271	1.00E-07		2.78E-03
22.67	272	1.00E-07		2.70E-03
22.75	273	1.00E-07		2.63E-03
22.83	274	1.00E-07		2.55E-03
22.92	275	1.00E-07		2.48E-03
23.00	276	1.00E-07		2.40E-03
23.08	277	1.00E-07		2.34E-03
23.17	278	1.00E-07		2.27E-03
23.25	279	1.00E-07		2.20E-03
23.33	280	1.00E-07		2.14E-03
23.42	281	1.00E-07		2.08E-03
23.50	282	1.00E-07		2.02E-03
23.58	283	1.00E-07		1.96E-03
23.67	284	1.00E-07		1.90E-03
23.75	285	1.00E-07		1.85E-03
23.83	286	1.00E-07		1.80E-03
23.92	287	1.00E-07		1.74E-03
24.00	288	1.00E-07		1.69E-03
24.08	289	1.00E-07		1.64E-03
24.17	290	1.00E-07		1.60E-03
24.25	291	1.00E-07		1.55E-03
24.33	292	1.00E-07		1.51E-03
24.42	293	1.00E-07		1.46E-03
24.50	294	1.00E-07		1.42E-03
24.58	295	1.00E-07		1.38E-03
24.67	296	1.00E-07		1.34E-03
24.75	297	1.00E-07		1.30E-03
24.83	298	1.00E-07		1.26E-03
24.92	299	1.00E-07		1.23E-03
25.00	300	1.00E-07		1.19E-03
		MAX		MAX
		1.39E+01		1.16E+00

SATURATED ZONE PARTITIONING				
SITE:	NIROP	Fridely	CONTAMINANT: PCE	
			HALF-LIFE (YRS): 0.00E+00	
INVESTIGATOR:		LK		
DATE:		2/4/97	DAF	2.40E+01
SATURATED LAYER				
INFILT (FT/YR):	0.548	KOC	279	
LENGTH (FT):	800	FOC	0.0016	
WIDTH (FT):	400	Kd (L/KG):	4.46E-01	
GROUNDWATER FLOW VELOCITY (FT/YR)	573	SATURATION:	1.00	
POROSITY	0.3	THICKNESS (FT):	12.50	
		DECAY (1/DAY):	0.00E+00	
DENSITY(G/CM3):	1.60	C3o (PPB):	0.00E+00	
		CU2 (PPB):	0.00E+00	
Q1 (L/DAY):	1.36E+04	Q2 (L/DAY):	6.67E+04	
TIME INTERVAL (YRS)		0.083333		
ELAPSED TIME - YRS	Month	Loading(ug/l)	SOURCE AREA CONC. C3 (UG/L)	
0.00	0	0.00E+00	0.00E+00	
0.08	1	6.53E+00	2.33E-02	
0.17	2	6.68E+00	4.66E-02	
0.25	3	6.67E+00	6.94E-02	
0.33	4	6.71E+00	9.19E-02	
0.42	5	6.73E+00	1.14E-01	
0.50	6	7.27E+00	1.37E-01	
0.58	7	7.45E+00	1.61E-01	
0.67	8	7.68E+00	1.85E-01	
0.75	9	7.53E+00	2.08E-01	
0.83	10	6.98E+00	2.29E-01	
0.92	11	6.39E+00	2.47E-01	
1.00	12	5.74E+00	2.62E-01	
1.08	13	5.15E+00	2.75E-01	
1.17	14	4.68E+00	2.86E-01	
1.25	15	4.15E+00	2.94E-01	
1.33	16	3.69E+00	3.01E-01	
1.42	17	3.24E+00	3.07E-01	
1.50	18	3.09E+00	3.11E-01	
1.58	19	2.80E+00	3.15E-01	
1.67	20	2.55E+00	3.17E-01	
1.75	21	2.33E+00	3.19E-01	
1.83	22	2.12E+00	3.20E-01	
1.92	23	1.93E+00	3.20E-01	
2.00	24	1.72E+00	3.19E-01	
2.08	25	1.54E+00	3.18E-01	
2.17	26	1.40E+00	3.16E-01	
2.25	27	1.24E+00	3.14E-01	
2.33	28	1.10E+00	3.11E-01	
2.42	29	9.67E-01	3.08E-01	
2.50	30	9.23E-01	3.05E-01	
2.58	31	8.35E-01	3.02E-01	

TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)
2.67	32	7.61E-01	2.98E-01
2.75	33	6.97E-01	2.94E-01
2.83	34	6.34E-01	2.90E-01
2.92	35	5.75E-01	2.86E-01
3.00	36	5.15E-01	2.82E-01
3.08	37	4.60E-01	2.78E-01
3.17	38	4.18E-01	2.73E-01
3.25	39	3.70E-01	2.69E-01
3.33	40	3.29E-01	2.64E-01
3.42	41	2.89E-01	2.60E-01
3.50	42	2.76E-01	2.55E-01
3.58	43	2.49E-01	2.51E-01
3.67	44	2.27E-01	2.46E-01
3.75	45	2.08E-01	2.42E-01
3.83	46	1.89E-01	2.38E-01
3.92	47	1.72E-01	2.33E-01
4.00	48	1.54E-01	2.29E-01
4.08	49	1.37E-01	2.24E-01
4.17	50	1.25E-01	2.20E-01
4.25	51	1.10E-01	2.16E-01
4.33	52	9.81E-02	2.12E-01
4.42	53	8.62E-02	2.08E-01
4.50	54	8.23E-02	2.04E-01
4.58	55	7.44E-02	2.00E-01
4.67	56	6.78E-02	1.96E-01
4.75	57	6.20E-02	1.92E-01
4.83	58	5.65E-02	1.88E-01
4.92	59	5.12E-02	1.84E-01
5.00	60	4.58E-02	1.80E-01
5.08	61	4.10E-02	1.77E-01
5.17	62	3.72E-02	1.73E-01
5.25	63	3.29E-02	1.70E-01
5.33	64	2.93E-02	1.66E-01
5.42	65	2.57E-02	1.63E-01
5.50	66	2.45E-02	1.59E-01
5.58	67	2.22E-02	1.56E-01
5.67	68	2.02E-02	1.53E-01
5.75	69	1.85E-02	1.50E-01
5.83	70	1.68E-02	1.47E-01
5.92	71	1.53E-02	1.44E-01
6.00	72	1.37E-02	1.41E-01
6.08	73	1.22E-02	1.38E-01
6.17	74	1.11E-02	1.35E-01
6.25	75	9.79E-03	1.32E-01
6.33	76	8.70E-03	1.29E-01
6.42	77	7.64E-03	1.27E-01
6.50	78	7.29E-03	1.24E-01
6.58	79	6.59E-03	1.21E-01
6.67	80	6.00E-03	1.19E-01
6.75	81	5.49E-03	1.16E-01
6.83	82	4.99E-03	1.14E-01
6.92	83	4.52E-03	1.12E-01
7.00	84	4.04E-03	1.09E-01
7.08	85	3.61E-03	1.07E-01
7.17	86	3.28E-03	1.05E-01
7.25	87	2.89E-03	1.03E-01

TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)
7.33	88	2.57E-03	1.00E-01
7.42	89	2.25E-03	9.83E-02
7.50	90	2.15E-03	9.62E-02
7.58	91	1.94E-03	9.42E-02
7.67	92	1.76E-03	9.22E-02
7.75	93	1.61E-03	9.03E-02
7.83	94	1.46E-03	8.84E-02
7.92	95	1.32E-03	8.65E-02
8.00	96	1.18E-03	8.47E-02
8.08	97	1.05E-03	8.29E-02
8.17	98	9.51E-04	8.12E-02
8.25	99	8.36E-04	7.95E-02
8.33	100	7.39E-04	7.78E-02
8.42	101	6.45E-04	7.62E-02
8.50	102	6.11E-04	7.46E-02
8.58	103	5.49E-04	7.30E-02
8.67	104	4.95E-04	7.15E-02
8.75	105	4.49E-04	7.00E-02
8.83	106	4.04E-04	6.85E-02
8.92	107	3.62E-04	6.71E-02
9.00	108	3.20E-04	6.57E-02
9.08	109	2.83E-04	6.43E-02
9.17	110	2.51E-04	6.29E-02
9.25	111	2.18E-04	6.16E-02
9.33	112	1.90E-04	6.03E-02
9.42	113	1.62E-04	5.90E-02
9.50	114	1.51E-04	5.78E-02
9.58	115	1.32E-04	5.66E-02
9.67	116	1.16E-04	5.54E-02
9.75	117	1.01E-04	5.42E-02
9.83	118	8.66E-05	5.31E-02
9.92	119	7.30E-05	5.20E-02
10.00	120	6.10E-05	5.09E-02
10.08	121	5.02E-05	4.98E-02
10.17	122	4.11E-05	4.88E-02
10.25	123	3.24E-05	4.77E-02
10.33	124	2.55E-05	4.67E-02
10.42	125	1.94E-05	4.58E-02
10.50	126	1.53E-05	4.48E-02
10.58	127	9.80E-06	4.38E-02
10.67	128	4.80E-06	4.29E-02
10.75	129	2.00E-07	4.20E-02
10.83	130	1.00E-07	4.11E-02
10.92	131	1.00E-07	4.03E-02
11.00	132	1.00E-07	3.94E-02
11.08	133	1.00E-07	3.86E-02
11.17	134	1.00E-07	3.78E-02
11.25	135	1.00E-07	3.70E-02
11.33	136	1.00E-07	3.62E-02
11.42	137	1.00E-07	3.54E-02
11.50	138	1.00E-07	3.47E-02
11.58	139	1.00E-07	3.40E-02
11.67	140	1.00E-07	3.33E-02
11.75	141	1.00E-07	3.26E-02
11.83	142	1.00E-07	3.19E-02
11.92	143	1.00E-07	3.12E-02

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
12.00	144	1.00E-07		3.05E-02
12.08	145	1.00E-07		2.99E-02
12.17	146	1.00E-07		2.93E-02
12.25	147	1.00E-07		2.87E-02
12.33	148	1.00E-07		2.81E-02
12.42	149	1.00E-07		2.75E-02
12.50	150	1.00E-07		2.69E-02
12.58	151	1.00E-07		2.63E-02
12.67	152	1.00E-07		2.58E-02
12.75	153	1.00E-07		2.52E-02
12.83	154	1.00E-07		2.47E-02
12.92	155	1.00E-07		2.42E-02
13.00	156	1.00E-07		2.37E-02
13.08	157	1.00E-07		2.32E-02
13.17	158	1.00E-07		2.27E-02
13.25	159	1.00E-07		2.22E-02
13.33	160	1.00E-07		2.17E-02
13.42	161	1.00E-07		2.13E-02
13.50	162	1.00E-07		2.08E-02
13.58	163	1.00E-07		2.04E-02
13.67	164	1.00E-07		2.00E-02
13.75	165	1.00E-07		1.95E-02
13.83	166	1.00E-07		1.91E-02
13.92	167	1.00E-07		1.87E-02
14.00	168	1.00E-07		1.83E-02
14.08	169	1.00E-07		1.79E-02
14.17	170	1.00E-07		1.76E-02
14.25	171	1.00E-07		1.72E-02
14.33	172	1.00E-07		1.68E-02
14.42	173	1.00E-07		1.65E-02
14.50	174	1.00E-07		1.61E-02
14.58	175	1.00E-07		1.58E-02
14.67	176	1.00E-07		1.55E-02
14.75	177	1.00E-07		1.51E-02
14.83	178	1.00E-07		1.48E-02
14.92	179	1.00E-07		1.45E-02
15.00	180	1.00E-07		1.42E-02
15.08	181	1.00E-07		1.39E-02
15.17	182	1.00E-07		1.36E-02
15.25	183	1.00E-07		1.33E-02
15.33	184	1.00E-07		1.30E-02
15.42	185	1.00E-07		1.28E-02
15.50	186	1.00E-07		1.25E-02
15.58	187	1.00E-07		1.22E-02
15.67	188	1.00E-07		1.20E-02
15.75	189	1.00E-07		1.17E-02
15.83	190	1.00E-07		1.15E-02
15.92	191	1.00E-07		1.12E-02
16.00	192	1.00E-07		1.10E-02
16.08	193	1.00E-07		1.08E-02
16.17	194	1.00E-07		1.05E-02
16.25	195	1.00E-07		1.03E-02
16.33	196	1.00E-07		1.01E-02
16.42	197	1.00E-07		9.90E-03
16.50	198	1.00E-07		9.69E-03
16.58	199	1.00E-07		9.48E-03

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)	
16.67	200	1.00E-07	9.28E-03	
16.75	201	1.00E-07	9.09E-03	
16.83	202	1.00E-07	8.90E-03	
16.92	203	1.00E-07	8.71E-03	
17.00	204	1.00E-07	8.53E-03	
17.08	205	1.00E-07	8.35E-03	
17.17	206	1.00E-07	8.17E-03	
17.25	207	1.00E-07	8.00E-03	
17.33	208	1.00E-07	7.83E-03	
17.42	209	1.00E-07	7.67E-03	
17.50	210	1.00E-07	7.51E-03	
17.58	211	1.00E-07	7.35E-03	
17.67	212	1.00E-07	7.19E-03	
17.75	213	1.00E-07	7.04E-03	
17.83	214	1.00E-07	6.89E-03	
17.92	215	1.00E-07	6.75E-03	
18.00	216	1.00E-07	6.61E-03	
18.08	217	1.00E-07	6.47E-03	
18.17	218	1.00E-07	6.33E-03	
18.25	219	1.00E-07	6.20E-03	
18.33	220	1.00E-07	6.07E-03	
18.42	221	1.00E-07	5.94E-03	
18.50	222	1.00E-07	5.81E-03	
18.58	223	1.00E-07	5.69E-03	
18.67	224	1.00E-07	5.57E-03	
18.75	225	1.00E-07	5.46E-03	
18.83	226	1.00E-07	5.34E-03	
18.92	227	1.00E-07	5.23E-03	
19.00	228	1.00E-07	5.12E-03	
19.08	229	1.00E-07	5.01E-03	
19.17	230	1.00E-07	4.91E-03	
19.25	231	1.00E-07	4.80E-03	
19.33	232	1.00E-07	4.70E-03	
19.42	233	1.00E-07	4.60E-03	
19.50	234	1.00E-07	4.51E-03	
19.58	235	1.00E-07	4.41E-03	
19.67	236	1.00E-07	4.32E-03	
19.75	237	1.00E-07	4.23E-03	
19.83	238	1.00E-07	4.14E-03	
19.92	239	1.00E-07	4.05E-03	
20.00	240	1.00E-07	3.97E-03	
20.08	241	1.00E-07	3.88E-03	
20.17	242	1.00E-07	3.80E-03	
20.25	243	1.00E-07	3.72E-03	
20.33	244	1.00E-07	3.64E-03	
20.42	245	1.00E-07	3.57E-03	
20.50	246	1.00E-07	3.49E-03	
20.58	247	1.00E-07	3.42E-03	
20.67	248	1.00E-07	3.35E-03	
20.75	249	1.00E-07	3.27E-03	
20.83	250	1.00E-07	3.21E-03	
20.92	251	1.00E-07	3.14E-03	
21.00	252	1.00E-07	3.07E-03	
21.08	253	1.00E-07	3.01E-03	
21.17	254	1.00E-07	2.94E-03	
21.25	255	1.00E-07	2.88E-03	

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
21.33	256	1.00E-07		2.82E-03
21.42	257	1.00E-07		2.76E-03
21.50	258	1.00E-07		2.70E-03
21.58	259	1.00E-07		2.65E-03
21.67	260	1.00E-07		2.59E-03
21.75	261	1.00E-07		2.54E-03
21.83	262	1.00E-07		2.48E-03
21.92	263	1.00E-07		2.43E-03
22.00	264	1.00E-07		2.38E-03
22.08	265	1.00E-07		2.33E-03
22.17	266	1.00E-07		2.28E-03
22.25	267	1.00E-07		2.23E-03
22.33	268	1.00E-07		2.19E-03
22.42	269	1.00E-07		2.14E-03
22.50	270	1.00E-07		2.10E-03
22.58	271	1.00E-07		2.05E-03
22.67	272	1.00E-07		2.01E-03
22.75	273	1.00E-07		1.97E-03
22.83	274	1.00E-07		1.92E-03
22.92	275	1.00E-07		1.88E-03
23.00	276	1.00E-07		1.84E-03
23.08	277	1.00E-07		1.81E-03
23.17	278	1.00E-07		1.77E-03
23.25	279	1.00E-07		1.73E-03
23.33	280	1.00E-07		1.69E-03
23.42	281	1.00E-07		1.66E-03
23.50	282	1.00E-07		1.62E-03
23.58	283	1.00E-07		1.59E-03
23.67	284	1.00E-07		1.56E-03
23.75	285	1.00E-07		1.52E-03
23.83	286	1.00E-07		1.49E-03
23.92	287	1.00E-07		1.46E-03
24.00	288	1.00E-07		1.43E-03
24.08	289	1.00E-07		1.40E-03
24.17	290	1.00E-07		1.37E-03
24.25	291	1.00E-07		1.34E-03
24.33	292	1.00E-07		1.31E-03
24.42	293	1.00E-07		1.28E-03
24.50	294	1.00E-07		1.26E-03
24.58	295	1.00E-07		1.23E-03
24.67	296	1.00E-07		1.21E-03
24.75	297	1.00E-07		1.18E-03
24.83	298	1.00E-07		1.16E-03
24.92	299	1.00E-07		1.13E-03
25.00	300	1.00E-07		1.11E-03
		MAX		MAX
		7.68E+00		3.20E-01

SATURATED ZONE PARTITIONING				
SITE:		NIROP	Fridely	CONTAMINANT: DCE
INVESTIGATOR:		LK		HALF-LIFE (YRS): 0.00E+00
DATE:		2/4/97		DAF 9.89E+00
SATURATED LAYER				
INFILT (FT/YR):		0.548	KOC	94
LENGTH (FT):		800	FOC	0.0016
WIDTH (FT):		400	Kd (L/KG):	1.50E-01
GROUNDWATER FLOW VELOCITY (FT/YR)		573	SATURATION:	1.00
POROSITY		0.3	THICKNESS (FT):	12.50
DENSITY(G/CM3):		1.60	DECAY (1/DAY):	0.00E+00
			C3o (PPB):	0.00E+00
			CU2 (PPB):	0.00E+00
Q1 (L/DAY):		1.36E+04	Q2 (L/DAY):	6.67E+04
TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3	
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)	
0.00	0	0.00E+00	0.00E+00	
0.08	1	1.11E+02	7.37E-01	
0.17	2	9.00E+01	1.30E+00	
0.25	3	8.09E+01	1.79E+00	
0.33	4	7.83E+01	2.24E+00	
0.42	5	7.85E+01	2.67E+00	
0.50	6	7.43E+01	3.06E+00	
0.58	7	7.86E+01	3.46E+00	
0.67	8	8.08E+01	3.86E+00	
0.75	9	8.27E+01	4.26E+00	
0.83	10	8.50E+01	4.65E+00	
0.92	11	8.67E+01	5.05E+00	
1.00	12	8.84E+01	5.44E+00	
1.08	13	8.87E+01	5.81E+00	
1.17	14	8.66E+01	6.16E+00	
1.25	15	8.78E+01	6.50E+00	
1.33	16	8.88E+01	6.83E+00	
1.42	17	9.02E+01	7.16E+00	
1.50	18	8.55E+01	7.45E+00	
1.58	19	9.05E+01	7.76E+00	
1.67	20	9.31E+01	8.07E+00	
1.75	21	9.55E+01	8.39E+00	
1.83	22	9.84E+01	8.71E+00	
1.92	23	1.01E+02	9.04E+00	
2.00	24	1.04E+02	9.37E+00	
2.08	25	1.05E+02	9.70E+00	
2.17	26	1.04E+02	1.00E+01	
2.25	27	1.06E+02	1.03E+01	
2.33	28	1.07E+02	1.06E+01	
2.42	29	1.09E+02	1.09E+01	
2.50	30	1.09E+02	1.12E+01	
2.58	31	1.19E+02	1.16E+01	

TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)
2.67	32	1.26E+02	1.20E+01
2.75	33	1.35E+02	1.24E+01
2.83	34	1.43E+02	1.28E+01
2.92	35	1.49E+02	1.33E+01
3.00	36	1.48E+02	1.38E+01
3.08	37	1.39E+02	1.42E+01
3.17	38	1.28E+02	1.45E+01
3.25	39	1.20E+02	1.47E+01
3.33	40	1.13E+02	1.49E+01
3.42	41	1.05E+02	1.50E+01
3.50	42	9.50E+01	1.50E+01
3.58	43	9.37E+01	1.51E+01
3.67	44	8.96E+01	1.51E+01
3.75	45	8.53E+01	1.50E+01
3.83	46	8.12E+01	1.50E+01
3.92	47	7.67E+01	1.49E+01
4.00	48	7.21E+01	1.48E+01
4.08	49	6.67E+01	1.47E+01
4.17	50	6.11E+01	1.45E+01
4.25	51	5.73E+01	1.43E+01
4.33	52	5.34E+01	1.41E+01
4.42	53	4.97E+01	1.39E+01
4.50	54	4.50E+01	1.36E+01
4.58	55	4.44E+01	1.34E+01
4.67	56	4.24E+01	1.32E+01
4.75	57	4.04E+01	1.29E+01
4.83	58	3.84E+01	1.27E+01
4.92	59	3.63E+01	1.24E+01
5.00	60	3.41E+01	1.21E+01
5.08	61	3.15E+01	1.19E+01
5.17	62	2.89E+01	1.16E+01
5.25	63	2.71E+01	1.13E+01
5.33	64	2.53E+01	1.11E+01
5.42	65	2.35E+01	1.08E+01
5.50	66	2.13E+01	1.05E+01
5.58	67	2.10E+01	1.02E+01
5.67	68	2.00E+01	9.96E+00
5.75	69	1.91E+01	9.70E+00
5.83	70	1.81E+01	9.44E+00
5.92	71	1.71E+01	9.18E+00
6.00	72	1.61E+01	8.93E+00
6.08	73	1.49E+01	8.68E+00
6.17	74	1.36E+01	8.43E+00
6.25	75	1.28E+01	8.19E+00
6.33	76	1.19E+01	7.95E+00
6.42	77	1.11E+01	7.71E+00
6.50	78	1.01E+01	7.47E+00
6.58	79	9.91E+00	7.25E+00
6.67	80	9.46E+00	7.03E+00
6.75	81	9.01E+00	6.81E+00
6.83	82	8.57E+00	6.60E+00
6.92	83	8.09E+00	6.40E+00
7.00	84	7.60E+00	6.20E+00
7.08	85	7.04E+00	6.00E+00
7.17	86	6.44E+00	5.81E+00
7.25	87	6.05E+00	5.62E+00

TIME INTERVAL (YRS)		0.083333	SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug l)	(UG/L)
7.33	88	5.64E+00	5.44E+00
7.42	89	5.24E+00	5.26E+00
7.50	90	4.75E+00	5.09E+00
7.58	91	4.68E+00	4.92E+00
7.67	92	4.47E+00	4.76E+00
7.75	93	4.26E+00	4.60E+00
7.83	94	4.05E+00	4.45E+00
7.92	95	3.82E+00	4.30E+00
8.00	96	3.59E+00	4.15E+00
8.08	97	3.33E+00	4.01E+00
8.17	98	3.05E+00	3.88E+00
8.25	99	2.86E+00	3.74E+00
8.33	100	2.66E+00	3.61E+00
8.42	101	2.48E+00	3.49E+00
8.50	102	2.25E+00	3.37E+00
8.58	103	2.21E+00	3.25E+00
8.67	104	2.11E+00	3.14E+00
8.75	105	2.01E+00	3.03E+00
8.83	106	1.91E+00	2.92E+00
8.92	107	1.81E+00	2.82E+00
9.00	108	1.70E+00	2.72E+00
9.08	109	1.57E+00	2.63E+00
9.17	110	1.44E+00	2.53E+00
9.25	111	1.35E+00	2.44E+00
9.33	112	1.26E+00	2.36E+00
9.42	113	1.17E+00	2.27E+00
9.50	114	1.06E+00	2.19E+00
9.58	115	1.05E+00	2.11E+00
9.67	116	9.99E-01	2.03E+00
9.75	117	9.51E-01	1.96E+00
9.83	118	9.04E-01	1.89E+00
9.92	119	8.54E-01	1.82E+00
10.00	120	8.02E-01	1.76E+00
10.08	121	7.43E-01	1.69E+00
10.17	122	6.80E-01	1.63E+00
10.25	123	6.38E-01	1.57E+00
10.33	124	5.95E-01	1.51E+00
10.42	125	5.53E-01	1.46E+00
10.50	126	5.01E-01	1.40E+00
10.58	127	4.94E-01	1.35E+00
10.67	128	4.72E-01	1.30E+00
10.75	129	4.49E-01	1.26E+00
10.83	130	4.27E-01	1.21E+00
10.92	131	4.04E-01	1.16E+00
11.00	132	3.79E-01	1.12E+00
11.08	133	3.51E-01	1.08E+00
11.17	134	3.21E-01	1.04E+00
11.25	135	3.01E-01	1.00E+00
11.33	136	2.81E-01	9.64E-01
11.42	137	2.61E-01	9.28E-01
11.50	138	2.37E-01	8.93E-01
11.58	139	2.33E-01	8.60E-01
11.67	140	2.23E-01	8.27E-01
11.75	141	2.12E-01	7.97E-01
11.83	142	2.02E-01	7.67E-01
11.92	143	1.91E-01	7.38E-01

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
12.00	144	1.79E-01		7.10E-01
12.08	145	1.66E-01		6.84E-01
12.17	146	1.52E-01		6.58E-01
12.25	147	1.42E-01		6.33E-01
12.33	148	1.33E-01		6.09E-01
12.42	149	1.24E-01		5.86E-01
12.50	150	1.12E-01		5.64E-01
12.58	151	1.10E-01		5.43E-01
12.67	152	1.05E-01		5.22E-01
12.75	153	1.00E-01		5.02E-01
12.83	154	9.54E-02		4.83E-01
12.92	155	9.01E-02		4.65E-01
13.00	156	8.46E-02		4.48E-01
13.08	157	7.84E-02		4.31E-01
13.17	158	7.17E-02		4.14E-01
13.25	159	6.73E-02		3.98E-01
13.33	160	6.27E-02		3.83E-01
13.42	161	5.83E-02		3.69E-01
13.50	162	5.28E-02		3.55E-01
13.58	163	5.21E-02		3.41E-01
13.67	164	4.97E-02		3.28E-01
13.75	165	4.74E-02		3.16E-01
13.83	166	4.51E-02		3.03E-01
13.92	167	4.25E-02		2.92E-01
14.00	168	4.00E-02		2.81E-01
14.08	169	3.70E-02		2.70E-01
14.17	170	3.39E-02		2.60E-01
14.25	171	3.18E-02		2.50E-01
14.33	172	2.96E-02		2.40E-01
14.42	173	2.75E-02		2.31E-01
14.50	174	2.50E-02		2.22E-01
14.58	175	2.46E-02		2.14E-01
14.67	176	2.35E-02		2.05E-01
14.75	177	2.24E-02		1.97E-01
14.83	178	2.13E-02		1.90E-01
14.92	179	2.01E-02		1.83E-01
15.00	180	1.89E-02		1.76E-01
15.08	181	1.75E-02		1.69E-01
15.17	182	1.60E-02		1.62E-01
15.25	183	1.50E-02		1.56E-01
15.33	184	1.40E-02		1.50E-01
15.42	185	1.30E-02		1.44E-01
15.50	186	1.18E-02		1.39E-01
15.58	187	1.16E-02		1.33E-01
15.67	188	1.11E-02		1.28E-01
15.75	189	1.05E-02		1.23E-01
15.83	190	1.00E-02		1.19E-01
15.92	191	9.47E-03		1.14E-01
16.00	192	8.90E-03		1.10E-01
16.08	193	8.24E-03		1.05E-01
16.17	194	7.54E-03		1.01E-01
16.25	195	7.07E-03		9.74E-02
16.33	196	6.59E-03		9.36E-02
16.42	197	6.12E-03		9.00E-02
16.50	198	5.55E-03		8.65E-02
16.58	199	5.47E-03		8.32E-02

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)	(UG/L)	
16.67	200	5.22E-03	7.99E-02	
16.75	201	4.97E-03	7.68E-02	
16.83	202	4.73E-03	7.39E-02	
16.92	203	4.46E-03	7.10E-02	
17.00	204	4.19E-03	6.83E-02	
17.08	205	3.89E-03	6.56E-02	
17.17	206	3.56E-03	6.31E-02	
17.25	207	3.33E-03	6.06E-02	
17.33	208	3.11E-03	5.83E-02	
17.42	209	2.90E-03	5.60E-02	
17.50	210	2.62E-03	5.38E-02	
17.58	211	2.59E-03	5.18E-02	
17.67	212	2.46E-03	4.98E-02	
17.75	213	2.34E-03	4.78E-02	
17.83	214	2.24E-03	4.60E-02	
17.92	215	2.11E-03	4.42E-02	
18.00	216	1.97E-03	4.25E-02	
18.08	217	1.84E-03	4.08E-02	
18.17	218	1.67E-03	3.92E-02	
18.25	219	1.58E-03	3.77E-02	
18.33	220	1.47E-03	3.62E-02	
18.42	221	1.37E-03	3.48E-02	
18.50	222	1.22E-03	3.35E-02	
18.58	223	1.22E-03	3.22E-02	
18.67	224	1.17E-03	3.09E-02	
18.75	225	1.11E-03	2.97E-02	
18.83	226	1.05E-03	2.86E-02	
18.92	227	9.89E-04	2.75E-02	
19.00	228	9.32E-04	2.64E-02	
19.08	229	8.63E-04	2.54E-02	
19.17	230	7.99E-04	2.44E-02	
19.25	231	7.51E-04	2.34E-02	
19.33	232	6.95E-04	2.25E-02	
19.42	233	6.44E-04	2.16E-02	
19.50	234	5.72E-04	2.08E-02	
19.58	235	5.69E-04	2.00E-02	
19.67	236	5.43E-04	1.92E-02	
19.75	237	5.13E-04	1.85E-02	
19.83	238	4.86E-04	1.77E-02	
19.92	239	4.55E-04	1.71E-02	
20.00	240	4.27E-04	1.64E-02	
20.08	241	3.92E-04	1.58E-02	
20.17	242	3.51E-04	1.51E-02	
20.25	243	3.24E-04	1.45E-02	
20.33	244	2.97E-04	1.40E-02	
20.42	245	2.71E-04	1.34E-02	
20.50	246	2.50E-04	1.29E-02	
20.58	247	2.31E-04	1.24E-02	
20.67	248	2.20E-04	1.19E-02	
20.75	249	2.15E-04	1.15E-02	
20.83	250	2.15E-04	1.10E-02	
20.92	251	2.14E-04	1.06E-02	
21.00	252	2.05E-04	1.02E-02	
21.08	253	2.03E-04	9.78E-03	
21.17	254	1.97E-04	9.40E-03	
21.25	255	1.99E-04	9.03E-03	

TIME INTERVAL (YRS)		0.083333		SOURCE AREA CONC. C3
ELAPSED TIME - YRS	Month	Loading(ug/l)		(UG/L)
21.33	256	2.00E-04		8.68E-03
21.42	257	2.01E-04		8.34E-03
21.50	258	1.87E-04		8.01E-03
21.58	259	1.95E-04		7.70E-03
21.67	260	1.96E-04		7.40E-03
21.75	261	1.96E-04		7.11E-03
21.83	262	1.96E-04		6.84E-03
21.92	263	1.95E-04		6.57E-03
22.00	264	1.95E-04		6.32E-03
22.08	265	1.93E-04		6.07E-03
22.17	266	1.88E-04		5.83E-03
22.25	267	1.90E-04		5.61E-03
22.33	268	1.91E-04		5.39E-03
22.42	269	1.92E-04		5.18E-03
22.50	270	1.79E-04		4.98E-03
22.58	271	1.86E-04		4.78E-03
22.67	272	1.87E-04		4.60E-03
22.75	273	1.87E-04		4.42E-03
22.83	274	1.87E-04		4.25E-03
22.92	275	1.86E-04		4.08E-03
23.00	276	1.86E-04		3.93E-03
23.08	277	1.84E-04		3.77E-03
23.17	278	1.79E-04		3.63E-03
23.25	279	1.80E-04		3.49E-03
23.33	280	1.81E-04		3.35E-03
23.42	281	1.82E-04		3.22E-03
23.50	282	1.70E-04		3.10E-03
23.58	283	1.77E-04		2.98E-03
23.67	284	1.78E-04		2.86E-03
23.75	285	1.78E-04		2.75E-03
23.83	286	1.79E-04		2.64E-03
23.92	287	1.78E-04		2.54E-03
24.00	288	1.78E-04		2.44E-03
24.08	289	1.76E-04		2.35E-03
24.17	290	1.71E-04		2.26E-03
24.25	291	1.72E-04		2.17E-03
24.33	292	1.73E-04		2.09E-03
24.42	293	1.74E-04		2.01E-03
24.50	294	1.62E-04		1.93E-03
24.58	295	1.69E-04		1.86E-03
24.67	296	1.70E-04		1.78E-03
24.75	297	1.70E-04		1.72E-03
24.83	298	1.71E-04		1.65E-03
24.92	299	1.70E-04		1.59E-03
25.00	300	1.70E-04		1.52E-03
		MAX		MAX
		1.49E+02		1.51E+01

APPENDIX J

SESOIL MODELING FOR OU3

NIROP FRIDLEY
ESTIMATION OF INFILTRATION VALUE BENEATH BUILDING
7/1/98

1.0 Introduction

An estimate of the infiltration beneath the building (OU3) is needed for the SESOIL model. Strictly speaking, the roof and the foundation should prevent any infiltration and the value should be zero. However, to provide a conservative approach, an estimate of the storm sewer leakage, as a fraction of the total rainfall, could be made. Applying the total rainfall to the entire area is too conservative.

2.0 Approach

The approach taken was to assume that the pipe joints would leak. The leakage rate would be equal to the value of the criteria for sewer pipe testing in the PA Domestic Facilities Manual. This value is probably drawn from the Ten States Standards. This criteria is applied to a test in which the pipe is filled with water and 2 feet of head is applied. Thus, in that respect, the value is conservative since the sewers will not be flowing full. The actual quality of the joints is unknown. While some joints may be leaking more, some may be leaking less. No additional safety factor has been applied.

In addition, only the storm sewers were considered. The SESOIL model uses weather related data (storm event duration, frequency, quantity) as inputs and the storm sewer flow through pipes could be related to this information. The sanitary sewers were excluded primarily because of uncertainty in the general flow rates and presence of flow in the various lines. The drawings show a extensive sanitary sewer network with many tie-ins, many of which were floor drains. Thus, the normal state of many of these lines would be empty. Because of the limitations of information and because of the way data must be input to the model, the sanitary sewers were not considered directly. However, to account for a contribution from these sewers, the leakage rate used in the storm sewer calculation was multiplied by a factor of 2.

Using the site sewer drawings, the diameter and length of each of the main storm sewer lines that are beneath the plant were identified. Only the mainlines were considered and the small branches off many of the mains were ignored. (The only exception to this are the branches off the northernmost mainline.)

The leakage test criteria from the PA Domestic Facilities Manual is 100 gallons per day per diameter-inch per mile. In this case, one day is 24 hours. With a factor of 2 applied, this yields 200 gallons per day per diameter-inch per mile.

For each storm sewer line or segment, the leakage rate in gallons per day was calculated by the product of the above criteria, the pipe diameter and the length.

The climate data used for the OU2 SESOIL modeling was used to estimate the total water leakage on a monthly basis. The input data, for each month, includes the mean duration of a storm event during that month and the mean number storm events per month. Thus, the total leakage per month for each sewer line or segment is calculated by the product of the monthly leakage rate (gallons per day), number of storm events, and duration of the events (fraction of a day).

The total leakage per month is the sum of the monthly leakage from each line or segment. The data in this form can be converted to depth of precipitation (centimeters is used in the model) for each month and used as input to the model.

A copy of the calculation tables are attached.

3.0 Comparison to total rainfall

The total estimated leakage was compared to the total rainfall, such as would be experienced by uncovered ground. The footprint area of the NIROP facility is about 1,820,000 square feet. The total annual rainfall used in the OU2 SESOIL model is 26.7 inches. The total estimated storm water leakage is 168,000 gallons. This volume over the facility footprint equals 0.15 inches of rainfall, or about 0.6% of the total rainfall.

SESOIL Model Results: Leachate Entering Groundwater Versus Time

COC	TCE	PCE	DCE	TCA
Max Conc.	174.6	8.5	0.0	0.0

Year	Month	Total Months	Leachate (ppm)			
1	1	1	174.0	8.5	0	0
1	2	2	173.1	8.4	0	0
1	3	3	172.2	8.3	0	0
1	4	4	172.6	8.2	0	0
1	5	5	172.9	8.1	0	0
1	6	6	173.4	8.1	0	0
1	7	7	174.1	8.0	0	0
1	8	8	174.5	8.0	0	0
1	9	9	174.6	7.9	0	0
1	10	10	174.5	7.8	0	0
1	11	11	173.7	7.7	0	0
1	12	12	172.3	7.5	0	0
2	1	13	170.4	7.3	0	0
2	2	14	168.1	7.1	0	0
2	3	15	165.9	6.9	0	0
2	4	16	164.7	6.8	0	0
2	5	17	163.5	6.7	0	0
2	6	18	162.6	6.7	0	0
2	7	19	162.1	6.6	0	0
2	8	20	161.6	6.6	0	0
2	9	21	161.0	6.6	0	0
2	10	22	160.3	6.5	0	0
2	11	23	159.2	6.4	0	0
2	12	24	157.6	6.3	0	0
3	1	25	155.8	6.2	0	0
3	2	26	153.5	6.0	0	0
3	3	27	151.2	5.9	0	0
3	4	28	150.1	5.8	0	0

3	5	29	149.0	5.8	0	0
3	6	30	148.1	5.8	0	0
3	7	31	147.7	5.8	0	0
3	8	32	147.2	5.8	0	0
3	9	33	146.7	5.7	0	0
3	10	34	146.2	5.7	0	0
3	11	35	145.2	5.7	0	0
3	12	36	143.8	5.6	0	0
4	1	37	142.3	5.5	0	0
4	2	38	140.3	5.4	0	0
4	3	39	138.4	5.3	0	0
4	4	40	137.5	5.2	0	0
4	5	41	136.5	5.2	0	0
4	6	42	135.9	5.2	0	0
4	7	43	135.6	5.2	0	0
4	8	44	135.3	5.2	0	0
4	9	45	135.0	5.2	0	0
4	10	46	134.6	5.2	0	0
4	11	47	133.8	5.1	0	0
4	12	48	132.7	5.1	0	0
5	1	49	131.4	5.0	0	0
5	2	50	129.7	4.9	0	0
5	3	51	128.0	4.8	0	0
5	4	52	127.3	4.8	0	0
5	5	53	126.6	4.7	0	0
5	6	54	126.1	4.7	0	0
5	7	55	125.9	4.8	0	0
5	8	56	125.8	4.8	0	0
5	9	57	125.5	4.8	0	0
5	10	58	125.3	4.8	0	0
5	11	59	124.7	4.8	0	0
5	12	60	123.7	4.7	0	0
6	1	61	122.6	4.6	0	0
6	2	62	121.1	4.5	0	0
6	3	63	119.7	4.5	0	0
6	4	64	119.1	4.4	0	0
6	5	65	118.5	4.4	0	0
6	6	66	118.1	4.4	0	0
6	7	67	118.0	4.4	0	0

6	8	68	118.0	4.5	0	0
6	9	69	117.8	4.5	0	0
6	10	70	117.7	4.5	0	0
6	11	71	117.2	4.5	0	0
6	12	72	116.3	4.4	0	0
7	1	73	115.4	4.3	0	0
7	2	74	114.0	4.3	0	0
7	3	75	112.7	4.2	0	0
7	4	76	112.3	4.2	0	0
7	5	77	111.8	4.2	0	0
7	6	78	111.5	4.2	0	0
7	7	79	111.5	4.2	0	0
7	8	80	111.5	4.2	0	0
7	9	81	111.4	4.2	0	0
7	10	82	111.3	4.2	0	0
7	11	83	110.9	4.2	0	0
7	12	84	110.2	4.2	0	0
8	1	85	109.3	4.1	0	0
8	2	86	108.1	4.0	0	0
8	3	87	106.9	4.0	0	0
8	4	88	106.5	4.0	0	0
8	5	89	106.1	4.0	0	0
8	6	90	105.9	4.0	0	0
8	7	91	106.0	4.0	0	0
8	8	92	106.0	4.0	0	0
8	9	93	106.0	4.0	0	0
8	10	94	105.9	4.0	0	0
8	11	95	105.6	4.0	0	0
8	12	96	104.9	4.0	0	0
9	1	97	104.2	3.9	0	0
9	2	98	103.0	3.9	0	0
9	3	99	102.0	3.8	0	0
9	4	100	101.6	3.8	0	0
9	5	101	101.3	3.8	0	0
9	6	102	101.1	3.8	0	0
9	7	103	101.2	3.8	0	0
9	8	104	101.3	3.8	0	0
9	9	105	101.3	3.9	0	0
9	10	106	101.3	3.9	0	0

9	11	107	101.0	3.9	0	0
9	12	108	100.4	3.8	0	0
10	1	109	99.7	3.8	0	0
10	2	110	98.7	3.7	0	0
10	3	111	97.7	3.7	0	0
10	4	112	97.4	3.7	0	0
10	5	113	97.1	3.6	0	0
10	6	114	96.9	3.7	0	0
10	7	115	97.1	3.7	0	0
10	8	116	97.2	3.7	0	0
10	9	117	97.2	3.7	0	0
10	10	118	97.3	3.7	0	0
10	11	119	97.0	3.7	0	0
10	12	120	96.5	3.7	0	0
11	1	121	95.8	3.6	0	0
11	2	122	94.9	3.6	0	0
11	3	123	93.9	3.5	0	0
11	4	124	93.7	3.5	0	0
11	5	125	93.4	3.5	0	0
11	6	126	93.3	3.5	0	0
11	7	127	93.5	3.6	0	0
11	8	128	93.6	3.6	0	0
11	9	129	93.7	3.6	0	0
11	10	130	93.7	3.6	0	0
11	11	131	93.5	3.6	0	0
11	12	132	93.0	3.6	0	0
12	1	133	92.4	3.5	0	0
12	2	134	91.5	3.5	0	0
12	3	135	90.6	3.4	0	0
12	4	136	90.4	3.4	0	0
12	5	137	90.2	3.4	0	0
12	6	138	90.1	3.4	0	0
12	7	139	90.3	3.5	0	0
12	8	140	90.4	3.5	0	0
12	9	141	90.5	3.5	0	0
12	10	142	90.6	3.5	0	0
12	11	143	90.3	3.5	0	0
12	12	144	89.9	3.5	0	0
13	1	145	89.4	3.4	0	0

13	2	146	88.5	3.4	0	0
13	3	147	87.7	3.3	0	0
13	4	148	87.5	3.3	0	0
13	5	149	87.3	3.3	0	0
13	6	150	87.2	3.4	0	0
13	7	151	87.4	3.4	0	0
13	8	152	87.6	3.4	0	0
13	9	153	87.7	3.4	0	0
13	10	154	87.8	3.4	0	0
13	11	155	87.6	3.4	0	0
13	12	156	87.1	3.4	0	0
14	1	157	86.6	3.4	0	0
14	2	158	85.8	3.3	0	0
14	3	159	85.0	3.3	0	0
14	4	160	84.9	3.3	0	0
14	5	161	84.7	3.3	0	0
14	6	162	84.7	3.3	0	0
14	7	163	84.9	3.3	0	0
14	8	164	85.0	3.3	0	0
14	9	165	85.1	3.3	0	0
14	10	166	85.2	3.4	0	0
14	11	167	85.1	3.3	0	0
14	12	168	84.7	3.3	0	0
15	1	169	84.2	3.3	0	0
15	2	170	83.4	3.2	0	0
15	3	171	82.7	3.2	0	0
15	4	172	82.5	3.2	0	0
15	5	173	82.4	3.2	0	0
15	6	174	82.4	3.2	0	0
15	7	175	82.6	3.2	0	0
15	8	176	82.7	3.3	0	0
15	9	177	82.9	3.3	0	0
15	10	178	83.0	3.3	0	0
15	11	179	82.8	3.3	0	0
15	12	180	82.5	3.3	0	0
16	1	181	82.0	3.2	0	0
16	2	182	81.3	3.2	0	0
16	3	183	80.6	3.1	0	0
16	4	184	80.4	3.1	0	0

16	5	185	80.3	3.1	0	0
16	6	186	80.3	3.1	0	0
16	7	187	80.5	3.2	0	0
16	8	188	80.7	3.2	0	0
16	9	189	80.8	3.2	0	0
16	10	190	80.9	3.2	0	0
16	11	191	80.8	3.2	0	0
16	12	192	80.4	3.2	0	0
17	1	193	80.0	3.2	0	0
17	2	194	79.3	3.1	0	0
17	3	195	78.6	3.1	0	0
17	4	196	78.5	3.1	0	0
17	5	197	78.4	3.1	0	0
17	6	198	78.4	3.1	0	0
17	7	199	78.6	3.1	0	0
17	8	200	78.8	3.1	0	0
17	9	201	79.0	3.2	0	0
17	10	202	79.1	3.2	0	0
17	11	203	79.0	3.2	0	0
17	12	204	78.6	3.1	0	0
18	1	205	78.2	3.1	0	0
18	2	206	77.5	3.1	0	0
18	3	207	76.9	3.0	0	0
18	4	208	76.8	3.0	0	0
18	5	209	76.7	3.0	0	0
18	6	210	76.7	3.0	0	0
18	7	211	76.9	3.1	0	0
18	8	212	77.1	3.1	0	0
18	9	213	77.3	3.1	0	0
18	10	214	77.4	3.1	0	0
18	11	215	77.3	3.1	0	0
18	12	216	77.0	3.1	0	0
19	1	217	76.6	3.1	0	0
19	2	218	75.9	3.0	0	0
19	3	219	75.3	3.0	0	0
19	4	220	75.2	3.0	0	0
19	5	221	75.1	3.0	0	0
19	6	222	75.1	3.0	0	0
19	7	223	75.3	3.0	0	0

19	8	224	75.6	3.0	0	0
19	9	225	75.7	3.1	0	0
19	10	226	75.9	3.1	0	0
19	11	227	75.8	3.1	0	0
19	12	228	75.5	3.1	0	0
20	1	229	75.1	3.0	0	0
20	2	230	74.4	3.0	0	0
20	3	231	73.8	2.9	0	0
20	4	232	73.8	2.9	0	0
20	5	233	73.7	2.9	0	0
20	6	234	73.7	3.0	0	0
20	7	235	73.9	3.0	0	0
20	8	236	74.1	3.0	0	0
20	9	237	74.3	3.0	0	0
20	10	238	74.4	3.0	0	0
20	11	239	74.3	3.0	0	0
20	12	240	74.1	3.0	0	0
21	1	241	73.7	3.0	0	0
21	2	242	73.1	2.9	0	0
21	3	243	72.5	2.9	0	0
21	4	244	72.4	2.9	0	0
21	5	245	72.4	2.9	0	0
21	6	246	72.4	2.9	0	0
21	7	247	72.6	2.9	0	0
21	8	248	72.8	3.0	0	0
21	9	249	73.0	3.0	0	0
21	10	250	73.1	3.0	0	0
21	11	251	73.1	3.0	0	0
21	12	252	72.8	3.0	0	0
22	1	253	72.4	2.9	0	0
22	2	254	71.8	2.9	0	0
22	3	255	71.3	2.9	0	0
22	4	256	71.2	2.9	0	0
22	5	257	71.1	2.9	0	0
22	6	258	71.2	2.9	0	0
22	7	259	71.4	2.9	0	0
22	8	260	71.6	2.9	0	0
22	9	261	71.8	2.9	0	0
22	10	262	71.9	3.0	0	0

22	11	263	71.9	3.0	0	0
22	12	264	71.6	2.9	0	0
23	1	265	71.3	2.9	0	0
23	2	266	70.7	2.9	0	0
23	3	267	70.1	2.8	0	0
23	4	268	70.1	2.8	0	0
23	5	269	70.0	2.8	0	0
23	6	270	70.1	2.8	0	0
23	7	271	70.3	2.9	0	0
23	8	272	70.5	2.9	0	0
23	9	273	70.7	2.9	0	0
23	10	274	70.8	2.9	0	0
23	11	275	70.8	2.9	0	0
23	12	276	70.5	2.9	0	0
24	1	277	70.2	2.9	0	0
24	2	278	69.6	2.8	0	0
24	3	279	69.1	2.8	0	0
24	4	280	69.0	2.8	0	0
24	5	281	69.0	2.8	0	0
24	6	282	69.0	2.8	0	0
24	7	283	69.3	2.8	0	0
24	8	284	69.5	2.9	0	0
24	9	285	69.7	2.9	0	0
24	10	286	69.8	2.9	0	0
24	11	287	69.8	2.9	0	0
24	12	288	69.5	2.9	0	0
25	1	289	69.2	2.8	0	0
25	2	290	68.6	2.8	0	0
25	3	291	68.1	2.8	0	0
25	4	292	68.1	2.8	0	0
25	5	293	68.0	2.8	0	0
25	6	294	68.1	2.8	0	0
25	7	295	68.3	2.8	0	0
25	8	296	68.5	2.8	0	0
25	9	297	68.7	2.8	0	0
25	10	298	68.9	2.9	0	0
25	11	299	68.8	2.9	0	0
25	12	300	68.6	2.8	0	0

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*****
*****
***** SESOIL-84 : SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS *****
*****
***** DEVELOPERS: M. BONAZOUNTAS, ARTHUR D. LITTLE INC. , (617)864-5770, X5871 *****
***** J. WAGNER , DIS/ADLPIPE, INC. , (617)492-1991, X5820 *****
*****
***** MODIFIED EXTENSIVELY BY: *****
***** D.M. HETRICK *****
***** OAK RIDGE NATIONAL LABORATORY *****
***** (615) 576-7556 *****
***** VERSION : JANUARY 1995 *****
*****
*****

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***** MONTHLY SESOIL MODEL OPERATION *****
 MONTHLY SITE SPECIFIC SIMULATION

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REGION      : FRIDLEY NIROP OU3
SOIL TYPE   :
COMPOUND    : TCE
WASHLOAD DATA :
APPLICATION AREA: NIROP OU3 TCE

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GENERAL INPUT PARAMETERS
 =====

-- SOIL INPUT PARAMETERS --

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SOIL DENSITY (G/CM**3):      1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-):  12.0
POROSITY (-):                .400
ORGANIC CARBON CONTENT (%):   .250
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-):      1.00

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-- CHEMICAL INPUT PARAMETERS --

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SOLUBILITY (UG/ML):          .110E+04
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .100E-01

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HENRYS LAW CONSTANT (M**3-ATM/MOLE):	.117E-01
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC):	166.
ADSORPTION COEFFICIENT ON SOIL (K):	.000
MOLECULAR WEIGHT (G/MOL):	131.
VALENCE (-):	.000
NEUTRAL HYDROLYSIS CONSTANT (/DAY):	.000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY):	.000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY):	.000
DEGRADATION RATE IN MOISTURE (/DAY):	.000
DEGRADATION RATE ON SOIL (/DAY):	.000
LIGAND-POLLUTANT STABILITY CONSTANT (-):	.000
NO. MOLES LIGAND/MOLE POLLUTANT (-):	.000
LIGAND MOLECULAR WEIGHT (G/MOL):	.000

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-- APPLICATION INPUT PARAMETERS --
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NUMBER OF SOIL LAYERS:	4			
YEARS TO BE SIMULATED:	26			
AREA (CM**2):	0.130E+08			
APPLICATION AREA LATITUDE (DEG.):	44.9			
SPILL (1) OR STEADY APPLICATION (0):	0			
MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.:	0			
INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0)	1			
DEPTHS (CM):	0.12E+03	0.12E+03	0.12E+03	0.24E+03
NUMBER OF SUBLAYERS/LAYER	4	4	4	4
PH (CM):	0.00	0.00	0.00	0.00
INTRINSIC PERMEABILITIES (CM**2):	0.50E-10	0.50E-10	0.50E-10	0.50E-10
KDEL RATIOS (-):	1.0	1.0	1.0	
KDES RATIOS (-):	1.0	1.0	1.0	
OC RATIOS (-):	0.12	0.13	0.13	
CEC RATIOS (-):	1.0	1.0	1.0	
FRN RATIOS(-):	1.0	1.0	1.0	
ADS RATIOS(-):	1.0	1.0	1.0	

1 YEAR - 1 MONTHLY INPUT PARAMETERS
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-- CLIMATIC INPUT PARAMETERS --
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[illegible]

PRECIP. (CM)	0.027	0.021	0.003	0.003	0.003	0.058	0.030	0.046	0.056	0.050	0.051	0.034
M.TIME RAIN(DAYS)	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330	0.250	0.320	0.370
M. STORM NO. (-)	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600	5.890	5.220
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	2.20E-01	6.20E-01	1.02E+00	1.02E+00

LAYER 2:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	8.50E-01	8.50E-01	5.60E-01	5.60E-01

LAYER 3:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	8.70E-01	8.70E-01	1.18E+00	1.18E+00

LAYER 4:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	1.20E-01	8.27E+01	7.60E+01	7.16E+01

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*****
*****
***** SESOIL-84 : SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS *****
*****
***** DEVELOPERS: M. BONAZOUNTAS, ARTHUR D. LITTLE INC. , (617)864-5770, X5871 *****
***** J. WAGNER , DIS/ADLPIPE, INC. , (617)492-1991, X5820 *****
*****
***** MODIFIED EXTENSIVELY BY: *****
***** D.M. HETRICK *****
***** OAK RIDGE NATIONAL LABORATORY *****
***** (615) 576-7556 *****
***** VERSION : JANUARY 1995 *****
*****
*****

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***** MONTHLY SESOIL MODEL OPERATION *****
 MONTHLY SITE SPECIFIC SIMULATION

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REGION      : FRIDLEY NIROP OU3
SOIL TYPE   :
COMPOUND    : PCE
WASHLOAD DATA :
APPLICATION AREA: NIROP OU3 PCE

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GENERAL INPUT PARAMETERS
 =====

-- SOIL INPUT PARAMETERS --

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SOIL DENSITY (G/CM**3):      1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-):  12.0
POROSITY (-):                .400
ORGANIC CARBON CONTENT (%):  .250
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-):     1.00

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-- CHEMICAL INPUT PARAMETERS --

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SOLUBILITY (UG/ML):          150.
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .100E-01

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HENRYS LAW CONSTANT (M**3-ATM/MOLE): .287E-01
 ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 155.
 ADSORPTION COEFFICIENT ON SOIL (K): .000
 MOLECULAR WEIGHT (G/MOL): 166.
 VALENCE (-): .000
 NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
 BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
 ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
 DEGRADATION RATE IN MOISTURE (/DAY): .000
 DEGRADATION RATE ON SOIL (/DAY): .000
 LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
 NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
 LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
 YEARS TO BE SIMULATED: 26
 AREA (CM**2): 0.130E+08
 APPLICATION AREA LATITUDE (DEG.): 44.9
 SPILL (1) OR STEADY APPLICATION (0): 0
 MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0
 INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 0.12E+03 0.12E+03 0.12E+03 0.24E+03
 NUMBER OF SUBLAYERS/LAYER 4 4 4 4
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.50E-10 0.50E-10 0.50E-10 0.50E-10
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.12 0.13 0.13
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1

YEAR - 1 MONTHLY INPUT PARAMETERS

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-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830	19.830	14.280
CLOUD CVR (FRAC.)	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
REL. HUM.(FRAC.)	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700	0.700	0.700
ALBEDO (-)	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PRECIP. (CM)	0.027	0.021	0.003	0.003	0.003	0.058	0.030	0.046	0.056	0.050	0.051	0.034
M.TIME RAIN(DAYS)	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330	0.250	0.320	0.370
M. STORM NO. (-)	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600	5.890	5.220
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	3.60E-02	7.20E-02	7.20E-02

LAYER 2:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	7.00E-01	7.00E-01	5.90E-01	5.90E-01

LAYER 3:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	3.00E-01	3.00E-01	4.80E-04	4.80E-04

LAYER 4:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	4.80E-04	4.88E+00	4.40E+00	4.40E+00


```

*****
*****
***** SESOIL-84 : SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS *****
*****
***** DEVELOPERS: M. BONAZOUNTAS, ARTHUR D. LITTLE INC. , (617)864-5770, X5871 *****
***** J. WAGNER , DIS/ADLPIPE, INC. , (617)492-1991, X5820 *****
*****
***** MODIFIED EXTENSIVELY BY: *****
***** D.M. HETRICK *****
***** OAK RIDGE NATIONAL LABORATORY *****
***** (615) 576-7556 *****
***** VERSION : JANUARY 1995 *****
*****
*****

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***** MONTHLY SESOIL MODEL OPERATION *****
MONTHLY SITE SPECIFIC SIMULATION

```

REGION      : FRIDLEY NIROP OU3
SOIL TYPE   :
COMPOUND    : TCA
WASHLOAD DATA :
APPLICATION AREA: NIROP OU3 TCA

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GENERAL INPUT PARAMETERS
=====

-- SOIL INPUT PARAMETERS --

```

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 12.0
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): .250
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00

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-- CHEMICAL INPUT PARAMETERS --

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SOLUBILITY (UG/ML): .149E+04
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .100E-01

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HENRYS LAW CONSTANT (M**3-ATM/MOLE):      .408E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 110.
ADSORPTION COEFFICIENT ON SOIL (K):        .000
MOLECULAR WEIGHT (G/MOL):                  133.
VALENCE (-):                              .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY):        .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY):      .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY):      .000
DEGRADATION RATE IN MOISTURE (/DAY):       .000
DEGRADATION RATE ON SOIL (/DAY):          .000
LIGAND-POLLUTANT STABILITY CONSTANT (-):    .000
NO. MOLES LIGAND/MOLE POLLUTANT (-):       .000
LIGAND MOLECULAR WEIGHT (G/MOL):          .000

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-- APPLICATION INPUT PARAMETERS --

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NUMBER OF SOIL LAYERS:                      4
YEARS TO BE SIMULATED:                     26
AREA (CM**2):                             0.130E+08
APPLICATION AREA LATITUDE (DEG.):          44.9
SPILL (1) OR STEADY APPLICATION (0):       0
MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0
INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
DEPTHS (CM):                              0.12E+03 0.12E+03 0.12E+03 0.24E+03
NUMBER OF SUBLAYERS/LAYER                  4      4      4      4
PH (CM):                                  0.00    0.00    0.00    0.00
INTRINSIC PERMEABILITIES (CM**2):          0.50E-10 0.50E-10 0.50E-10 0.50E-10
KDEL RATIOS (-):                          1.0     1.0     1.0
KDES RATIOS (-):                          1.0     1.0     1.0
OC RATIOS (-):                           0.12    0.13    0.13
CEC RATIOS (-):                          1.0     1.0     1.0
FRN RATIOS(-):                           1.0     1.0     1.0
ADS RATIOS(-):                           1.0     1.0     1.0

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YEAR - 1 MONTHLY INPUT PARAMETERS
=====

-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830	19.830	14.280
CLOUD CVR (FRAC.)	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
REL. HUM.(FRAC.)	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700	0.700	0.700
ALBEDO (-)	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PRECIP. (CM)	0.027	0.021	0.003	0.003	0.003	0.058	0.030	0.046	0.056	0.050	0.051	0.034
M.TIME RAIN(DAYS)	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330	0.250	0.320	0.370
M. STORM NO. (-)	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600	5.890	5.220
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LAYER 2:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	1.40E-02	1.40E-02	1.30E-02	1.30E-02

LAYER 3:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LAYER 4:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

```

*****
*****
***** SESOIL-84 : SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS *****
*****
***** DEVELOPERS: M. BONAZOUNTAS, ARTHUR D. LITTLE INC. ,(617)864-5770,X5871 *****
***** J. WAGNER ,DIS/ADLPIPE, INC. ,(617)492-1991,X5820 *****
*****
***** MODIFIED EXTENSIVELY BY: *****
***** D.M. HETRICK *****
***** OAK RIDGE NATIONAL LABORATORY *****
***** (615) 576-7556 *****
***** VERSION : JANUARY 1995 *****
*****
*****

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***** MONTHLY SESOIL MODEL OPERATION *****
 MONTHLY SITE SPECIFIC SIMULATION

```

REGION      : FRIDLEY NIROP OU3
SOIL TYPE   :
COMPOUND    : DCE
WASHLOAD DATA :
APPLICATION AREA: NIROP OU3 DCE

```

GENERAL INPUT PARAMETERS
 =====

-- SOIL INPUT PARAMETERS --

```

SOIL DENSITY (G/CM**3): 1.60
INTRINSIC PERMEABILITY (CM**2): .000
DISCONNECTEDNESS INDEX (-): 12.0
POROSITY (-): .400
ORGANIC CARBON CONTENT (%): .250
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL): .000
FREUNDLICH EXPONENT (-): 1.00

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-- CHEMICAL INPUT PARAMETERS --

```

SOLUBILITY (UG/ML): 600.
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC): .100E-01

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HENRYS LAW CONSTANT (M**3-ATM/MOLE): .532E-02
 ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC): 58.9
 ADSORPTION COEFFICIENT ON SOIL (K): .000
 MOLECULAR WEIGHT (G/MOL): 96.9
 VALENCE (-): .000
 NEUTRAL HYDROLYSIS CONSTANT (/DAY): .000
 BASE HYDROLYSIS CONSTANT (L/MOL-DAY): .000
 ACID HYDROLYSIS CONSTANT (L/MOL-DAY): .000
 DEGRADATION RATE IN MOISTURE (/DAY): .000
 DEGRADATION RATE ON SOIL (/DAY): .000
 LIGAND-POLLUTANT STABILITY CONSTANT (-): .000
 NO. MOLES LIGAND/MOLE POLLUTANT (-): .000
 LIGAND MOLECULAR WEIGHT (G/MOL): .000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS: 4
 YEARS TO BE SIMULATED: 26
 AREA (CM**2): 0.130E+08
 APPLICATION AREA LATITUDE (DEG.): 44.9
 SPILL (1) OR STEADY APPLICATION (0): 0
 MODIFIED SUMMERS MODEL USED (1) OR NOT (0) FOR GWR. CONC.: 0
 INITIAL CHEMICAL CONCENTRATIONS GIVEN (1) OR NOT GIVEN (0) 1
 DEPTHS (CM): 0.12E+03 0.12E+03 0.12E+03 0.24E+03
 NUMBER OF SUBLAYERS/LAYER 4 4 4 4
 PH (CM): 0.00 0.00 0.00 0.00
 INTRINSIC PERMEABILITIES (CM**2): 0.50E-10 0.50E-10 0.50E-10 0.50E-10
 KDEL RATIOS (-): 1.0 1.0 1.0
 KDES RATIOS (-): 1.0 1.0 1.0
 OC RATIOS (-): 0.12 0.13 0.13
 CEC RATIOS (-): 1.0 1.0 1.0
 FRN RATIOS(-): 1.0 1.0 1.0
 ADS RATIOS(-): 1.0 1.0 1.0

1
 YEAR - 1 MONTHLY INPUT PARAMETERS
 =====

-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	8.830	-0.830	-8.780	-12.390	-9.940	-3.280	6.000	12.610	17.890	20.830	19.830	14.280
CLOUD CVR (FRAC.)	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
REL. HUM.(FRAC.)	0.700	0.800	0.750	0.750	0.750	0.700	0.650	0.650	0.700	0.700	0.700	0.700
ALBEDO (-)	0.160	0.240	0.280	0.280	0.280	0.300	0.190	0.160	0.160	0.160	0.160	0.160
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PRECIP. (CM)	0.027	0.021	0.003	0.003	0.003	0.058	0.030	0.046	0.056	0.050	0.051	0.034
M.TIME RAIN(DAYS)	0.460	0.530	0.480	0.460	0.470	0.610	0.510	0.400	0.330	0.250	0.320	0.370
M. STORM NO. (-)	3.440	3.030	2.780	2.340	2.170	3.830	4.690	6.630	6.800	5.600	5.890	5.220
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

INITIAL POLLUTANT CONCENTRATIONS IN UG/ML, INPUT FOR MONTH 1 OF YEAR 1

LAYER 1:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	1.30E-02	1.60E-01	3.00E-01	3.00E-01

LAYER 2:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LAYER 3:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LAYER 4:

SUBLAYER	1	2	3	4
INITIAL CONC. (UG/ML)	0.00E+00	0.00E+00	0.00E+00	0.00E+00